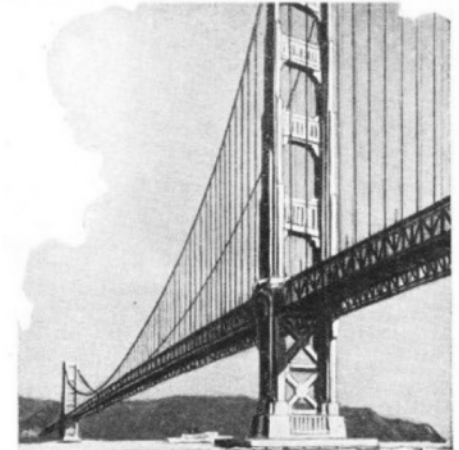


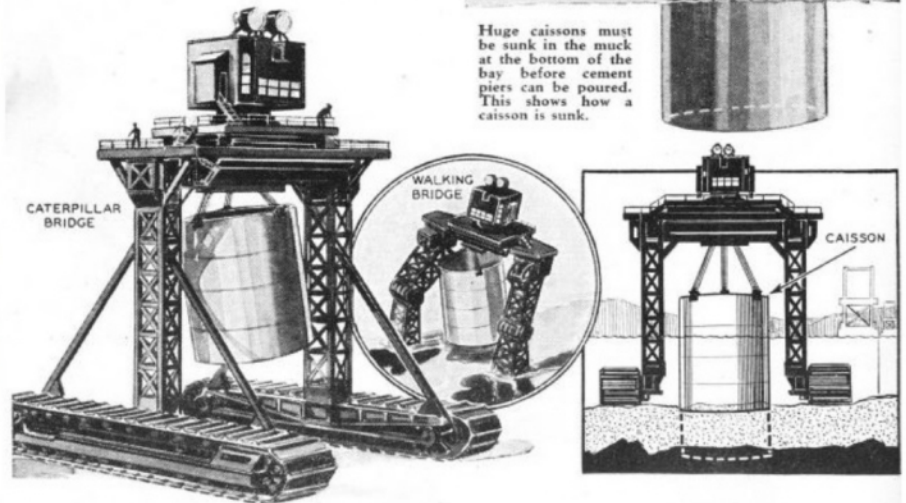


Механикс Иллюстрейтед Дайджест новое

Walking Bridges to Carry Caissons Is Latest Construction Suggestion



Huge caissons must be sunk in the muck at the bottom of the bay before cement piers can be poured. This shows how a caisson is sunk.



Сайенс энд Механикс Дайджест лучшее

MONORAILROAD TRAIN

... jet-powered

WHEN certain designs now in the drawing-board stage are finally completed, you may find yourself whizzing cross-country at over 400 mph in a super "El."

Combine the speed of an airliner, the safety of a trolley and the comfort of a Pullman—and you've got the formula for this revolutionary, suspended monorailroad, powered by jets.

The single-railed train could hurtle from coast-to-coast in less than 10 hours. Two jet engines, with auxiliary rockets or Jato units, would do the trick.

Over 100 passengers would be carried in one three-coach train, making only one stop for refueling at the halfway point. The coaches would be pressurized, air-conditioned and equipped with safety belts for whisking down mountains. Overhead rail-grippers would be suspended on stanchions dotted across the nation in a New York to California system. •

FRICTION BRAKE

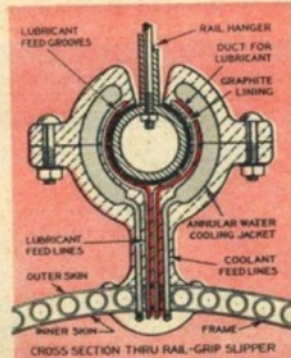
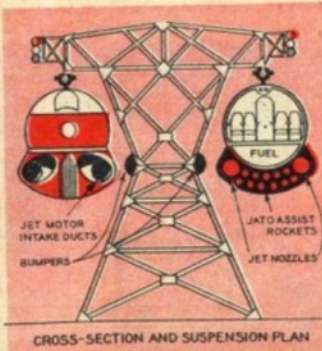
SEE CROSS-SECTION OF RAIL-GRIP SLIPPERS

TUBULAR MONORAIL

JET ENGINE INTAKE DUCTS

DOUGLAS ROLPE

BUMPER



Two powerful jet engines with auxiliary

All-weather, rail-gripping slippers

ICE PLOW FOR THE SEAWAY

KEY: Electric rotary saws (1) mounted in pivoting frames (2) cut ice into narrow ribbons, and chippers between saw blades break them into chunks. Chunks move along hinged ramps (3) which can swing upward to close bow and form a reinforced bow. Chunks go into chute (4) and ice crusher, but chips then enter blower, are expelled from pipe (5). In areas around docks, ice would be temporarily stored in hold (6). At sea, twin frames are uncoupled (7), swung aft on pivots (8) and carried in deck rests (9).



By Frank Tinsley

THE multi-million dollar St. Lawrence and Great Lakes Seaway has created a new American seacoast and turned inland commercial centers like Detroit, Chicago and Duluth into deepwater ports. It has also opened scores of lesser U. S. and Canadian cities to world oceanic trade. However, due to the severe winters, these areas are sealed off to Seaway traffic from December to March each year. This necessitates storing of supplies before the ice freezes and results in monumental costs that could be eliminated if these ports were ice-free year-round.

Conventional icebreakers are not the answer. While these sturdy ships do break up ice, they leave behind a mass of cracked pieces that tend to freeze again when the temperature drops. As a result, the icebreaker's job is an endless one.

This problem has long fascinated

[Continued on page 166]

AROUND THE WORLD

IN NOTHING FLAT!

By Frank Tinsley



WITHIN ten years or so you may be flying faster than the sun. When I say you, I mean *you*—not a hot-shot pilot in an experimental rocket ship but the average citizen who has the money for a trip across the country or around the world.

Air transport speeds have increased from 95 mph in 1930 to 350 mph today. New jet transport prototypes are flying at nearly twice the speed of the airliners currently flying the schedules. The Boeing 707 cruises at 600 mph, the Convair 880 at 615 mph. That means today's average commercial flying speeds will be nearly doubled by 1960—

M-WING, recently revived German idea, will lift passenger plane safely at 1500 mph.

Now
10¢

A FAWCETT PUBLICATION

SEPTEMBER

MECHANIX ILLUSTRATED



SEE PAGE 34

TAIL-FIRST PLANE TO FLY ATLANTIC IN FIVE HOURS!

Los Angeles to London

— Dawn Dusk

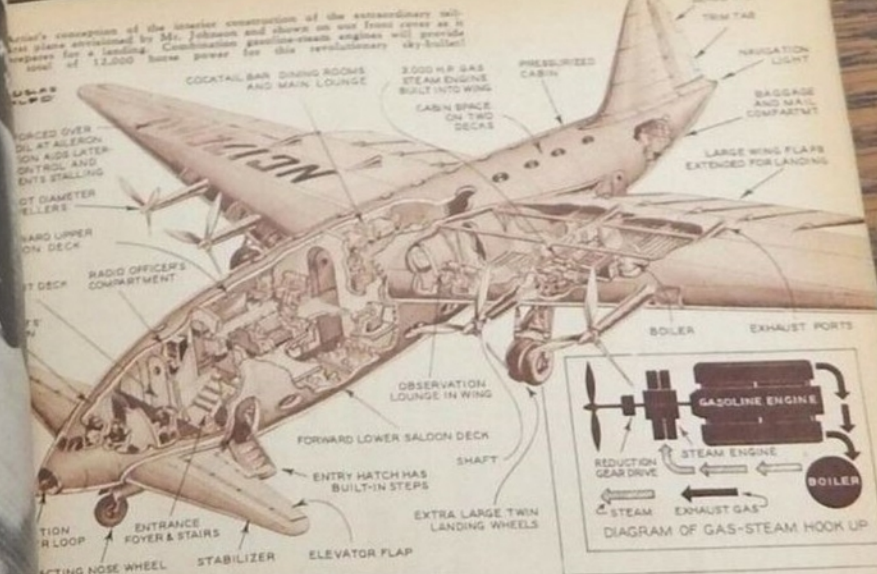
by Clarence L. Johnson
Chief Research Engineer,
Lockheed Aircraft Corporation

Who says that a tail-first plane with speed of 560 miles per hour is already taking shape in the minds of practical aeronautical designers.

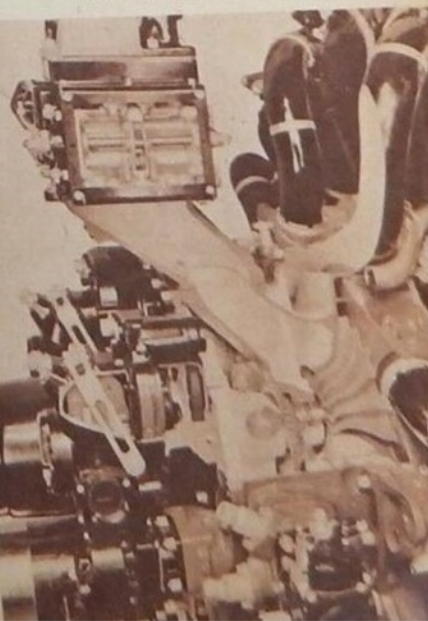
Above: Thundering over a field at 500 miles per hour, a huge formation of planes casts a sharp shadow on the field below. Below: The author, examines the Franklin D. Roosevelt Award in 1940.

ONE day . . . please don't date . . . you will be astonished. In the not-too-distant future, you will witness giant transports winging their way tail-first across the continent, then across the Atlantic, then from the Pacific coast of the United States to London. Fifty-six hundred miles in a half-day. From these lift ships we may see planes evolve gradually into powerful rockets, climbing swiftly to high altitudes and carrying their passengers at great speeds, perhaps faster than the present apparent limit of 746 miles an hour (the speed of sound) and setting them down safely on distant airports with even greater safety than man flies today. And the safety

September, 1940



Below: This close-up of a cutaway section of a Wright Cyclone 1000 h. p. engine gives some idea of the complexity of an airplane's power plant. Yet Mr. Johnson says that we will soon have engines of three times this size, to push the transports of the future at speeds approaching that of sound itself!



Huge plastic floats enable tanks to continue fighting while making water crossing.

RIVERS, lakes and deep streams will no longer present obstacles to Uncle Sam's rugged Armored Corps. The reason for this is the Army's huge new piece of flotation equipment which will enable a 48-ton tank to swim. Made of plastic, the float is constructed so that the tank can rotate its turret and fire its guns while on the water—and not be just a sitting duck. Drive sprockets power the propellers. When the tank lands, floats blow apart releasing the monster for land duty. •

Twin propellers which drive tank-carrying vehicle are visible under craft's hull.



Tank Wins Water War



AN ELECTRIC motor more than a quarter-mile long and as powerful as three passenger locomotives is the latest scientific answer to the problem of launching large airplanes from small landing fields without the initial shock of conventional catapults.

In a recent demonstration, the "Electropult," developed by Westinghouse, put a jet-propelled fighter into the air at 116 mph in four and one-tenth seconds after a run of only 320 feet. Without assistance, the plane would have required a run of 2,000 feet.

get 'em up
Fast!



World's fastest trolley line at left is essentially a linear motor—it delivers power in a straight line instead of the rotating pattern of the conventional type of electric motor commonly used.

Naval mechanics ready a sleek jet-propelled fighter plane, below, for its slingshot journey—in four and one-tenth seconds and a run of only 320 feet, it will gain a speed of more than 116 mph.



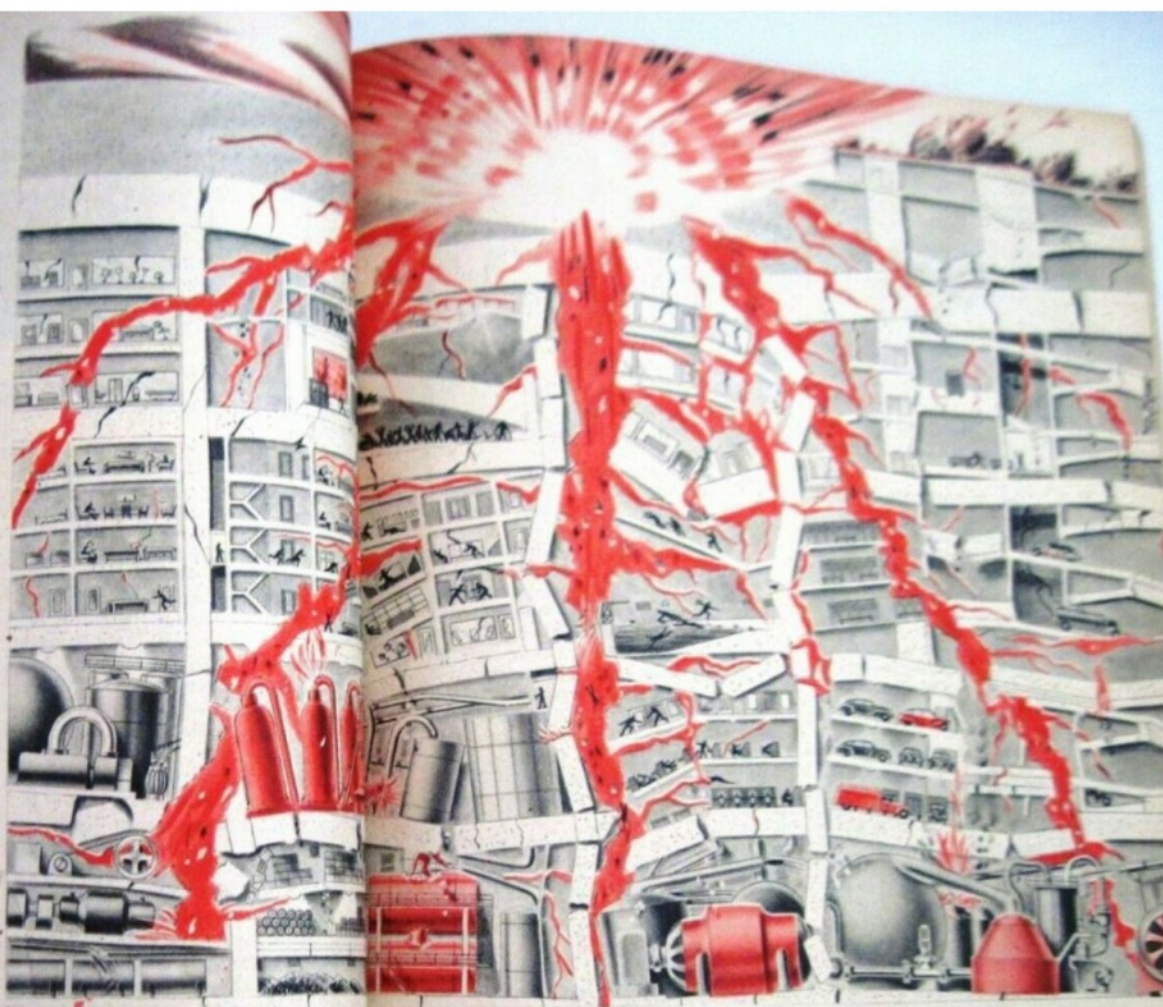
December, 1946

Deadlier than the atom bomb

BY WILLY LEY

Does the United States possess a weapon "far more formidable than the atomic bomb?" Is it a lithium bomb? The "lithium reaction" is known to power some of the stars.

It would not save us to build our cities underground: an atomic bomb, exploded on the surface, would destroy them utterly (right). A lithium bomb might be much worse. An uncontrolled chain reaction would blow up the whole earth!



FOR some time now there has been much speculation whether the United States possesses an even more destructive weapon than the atomic bomb and, if so, what it could possibly be. It all started with a remark made by a Congressman about a "weapon far more formidable than the atomic bomb itself," followed by the apologetic state-

ment "I guess I have said too much." What did he have in mind when he made that remark?

One newspaper commentator said that the weapon was based on cosmic rays, which does not mean much in itself since cosmic rays are simply rays of a very high power of penetration. Some observers guessed at biological or germ warfare. The remainder of the observers were divided into two camps of

very unequal size and strength. A few suspected that the whole incident was purely political in nature and not backed by anything tangible. Most decided that a new development in atomic weapons was behind all this.

There are several possible developments in atomic weapons, though it is doubtful if any has reached a finished state in light of the assertions of the top men in the atomic field, that vir-

Electronic BATTLEFIELD SCOUTS



By Frank Tinsley

ANOTHER duty of the soldier is being taken over by the machine. The screen of far-flung reconnaissance patrols, upon which military commanders have traditionally relied for intelligence of enemy movements, is being replaced by electronic scouts. Radar detects and pinpoints hostile movements through smoke, fog and dark of night. Mobile TV eyes provide the distant commander with a continuously moving picture of the battle as it develops at various points. Infrared sniperscopes can even sense an enemy by vehicle or body heat!

Soon, even the men now required to transport and operate these fantastic scouting gadgets will find their jobs gone. Already flying are robot planes in which the pilot has been replaced by remote control gear operated from a black box miles away. One of these, shown in

ROBOT surveillance drone in action over a battlefield. In background, transport and drone copter are landing Silent Scouts (see next pages).

NIGHT VIEW shows enemy column under surveillance by an M1 Silent Scout. 1. TV transmission antenna. 2. Infrared beam projector. 3. Fuel cell powerpack. 4. TV pick-up and transmitter. 5. Optical range finder. 6. Sten gun aimed by remote control. 7. Sten gun aimed by remote control. 8. Optical range finder. 9. Fuel cell powerpack. 10. Fuel cell powerpack. 11. Sten gun aimed by remote control. 12. Inertial gyro compass. 13. Rear Terra-tire. 14. Control station for Silent Scout. Observations from several Scout units here and moving target is pin-pointed on illuminated electronic map of nearby missile battery, the target's speed, direction and range are computed, waiting missiles are programmed and roar into action. Scout units made of off-the-shelf components and in a variety of sizes to perform special



BY '60

the lead illustration, is the Fairchild AN/USD-5, now under test. Powered by turbojet engines, these unmanned drones can follow land contours at low levels, flash over the battlefield, or climb to high altitudes for top deck missions. As they target for ground gunners. These aerial scouts can carry a variety of observation gear—radar, infrared or photographic cameras—and radio back their pictures in a continuous stream. Thus, if the machine is shot down at any point during its flight, all previously recorded information is safely in the hands of its operators—and no pilots are lost.

The tactics of tomorrow's wars will change

[Continued on page 160]



McCAHILL TESTS VOLKSWAGEN'S NEW 1500

MECHANIX ILLUSTRATED®

The How-to Magazine

Don't Miss This Shocking Report:
'THE CASE FOR CANNIBALISM!'

**BUILD A LOW-COST
HI-FI CENTER**

STILL
25¢
JANUARY



608034 A1 158012 088
P. AULD JR.
19C BASLER RD
GREENMOUNT MD

Amazing
t!

THIS OTTER GOES ANYWHERE

THE OTTER is what Lawrence Shaw calls the vehicle he designed and built for fishing and hunting trips into the Maine woods. Its small, flexible frame—along with the terrific traction provided by its wide, low-pressure tires—lets it pick its way over the roughest trail, packing in the fishing gear or hauling out the deer.

Controls of the Otter consist of three elements: steering wheel, brake pedal and hand throttle. In smoother terrain, the driver and passenger ride on foam-rubber-cushioned seats of the type used on farm tractors. Then, when the going gets rough, the operator can set the hand throttle and walk alongside. Low side-rails provide a handhold for riders stored behind, and the extremely low pressure of the 15-inch-wide Goodyear Terra Tires—only four or five pounds—gives a ride so smooth that spring suspension is unnecessary.

Powering the Otter is a six-hp Briggs & Stratton aluminum engine (chosen specifically to keep vehicle weight down) coupled to a torque converter

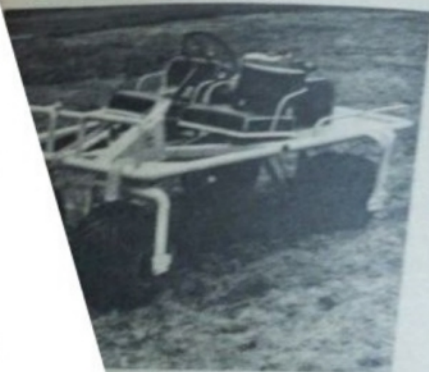
that starts a three-speed torque converter engine. The Otter's maximum speed is 9 mph.

The frame of the Otter is built in three sections—containing the engine, drive shaft and all one piece. The drive shaft is linked to each of the four wheels. This independent suspension lets the Otter easily over uneven terrain.

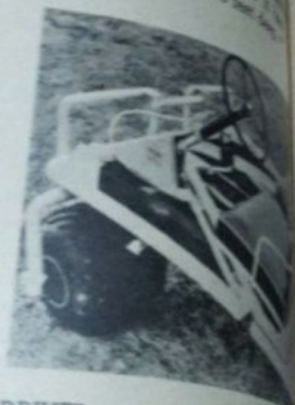
Where ground is rough, the Otter, a road can be made of saplings or logs for the tires. The tires roll as easily over logs as they would along rails. If the Otter is stuck in a bog, getting it out is a small problem. The Otter weighs about 450 pounds. The frame is 20 inches wide and the streams nearly two feet deep.



CROSS-COUNTRY vehicle takes off through the woods, headed for fishing hole. Driver can set throttle, dismount and walk alongside if ground gets too rough.



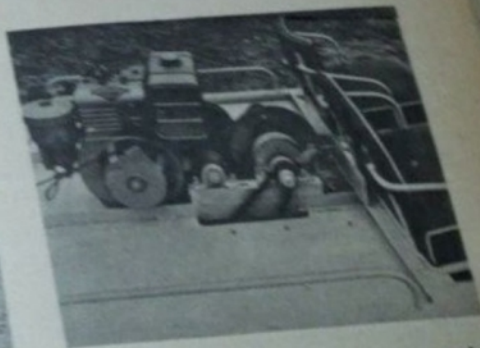
It can travel anywhere, even go off through the best fishing streams.



DRIVER and one passenger sit on rubber-cushioned seats. Rear deck is plywood; floorboards are tin.



GOODYEAR Terra Tires are 15 inches wide, provide plenty of traction. Drive-chains have steel protectors against logs, rocks.



SIX-HP Briggs & Stratton engine rests behind driver on steel plate. Aluminum mill was picked specially for its light weight.

MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

25¢

FEB.



MI's TRACTOR-TRAILER HOUSEBOAT

See Page 84



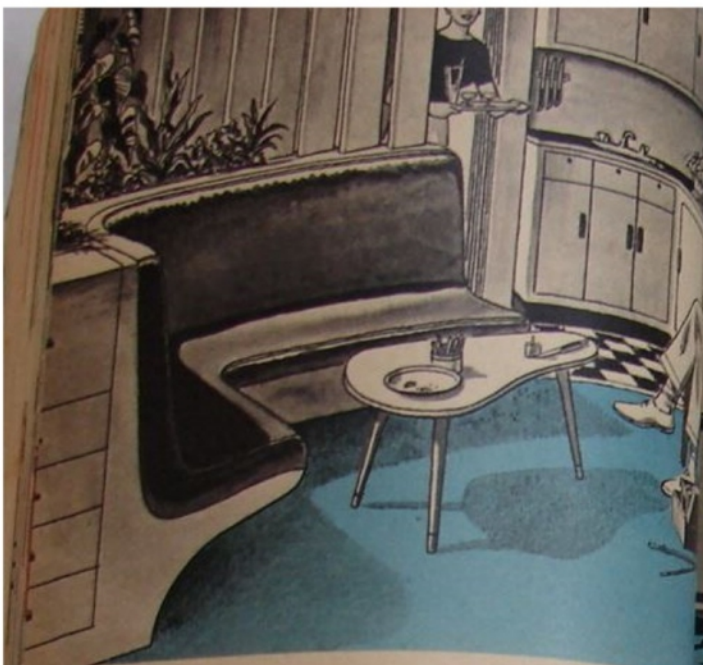
9 5 2006

McCAHILL TESTS THE SENSATIONAL NEW

THERE'S A FORTUNE WAIT

075

0597145
A J SCHROEDER



Sumptuous and spacious main cabin can be shut off from galley area by means of a sliding door.

Moored in some cozy cove you have an ideal summer home.

off both halves of the galley. Or, if the mood is convivial, the board half containing sink and refrigerator can be left open to serve as a bar—it's a view that is never offensive.

A built-in lounge unit divides the cabin, with vertical louvers cutting off the sight but not the ventilation of the cooking area. An angle of the unit houses a desk. A dining table sets up in front of the lounge with places for eight persons and a coffee table can be substituted between meals.

House plant containers built into the back of the lounge unit and an honest-to-goodness fireplace in the after bulkhead of the cabin should make things about as homey as any split-level, ranch-type house your wren could find.

Double glass doors flank either side of the fireplace and open to the afterdeck where fireplace fuel is stowed under the sun deck.



When luxurious craft is anchored during summer months you just dive off stern to go for a swim.

with a ready-made swimming pool and no grass to cut.

way. A bulwark gate in the center of the transom leads down to a swimming and boarding stage. Under way the stage folds forward and up, to stow against the top of the tunnel between the hulls of the houseboat.

A wind-dodger spans the forward end of the sun deck with a gate leading forward, across the gangway when in [Continued on page 199]



February, 1955

Mechanics

10¢ **MECHANIX ILLUSTRATED** SEPTEMBER 1941

THE AIRCRAFT GETS ITS TEETH • SEE PAGE 87



**MAJOR A. P. de SEVERSKY
FORECASTS—
THE AIRPLANE OF TOMORROW**

**Major Alexander P. de Seversky forecasts
THE AIRPLANE OF TOMORROW**

AS a goal to achieve, the subject of self-preservation is stronger than the love of life or any other human urge. That is why science in general makes more progress in a minute in general than in a field of peace. This is especially true of invention and mechanical engineering, which are used as weapons of retaliation in times of war.

During the war, the airplane showed a remarkable advance in its development. World War I was the first time in history that a quarter of a century's progress was achieved in a single year. Before 1914, the airplane was a toy, a novelty, a thing that could not be taken seriously. It was not until 1914 that it was practically perfected. It was created by the genius of the Frenchman, Louis Blériot, and by the end of the war, it was a powerful and deadly weapon. It was the airplane that won the war, and it was the airplane that saved the world from a worse fate.

Today, the airplane is a thing of beauty and power. It is a machine that can fly faster than the wind, and it can carry more than a hundred passengers. It is a machine that can fly over the ocean, and it can fly over the mountains. It is a machine that can fly over the world, and it can fly over the sky. It is a machine that can fly over the future, and it can fly over the dream.

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A WORLD YOU NEVER KNEW!

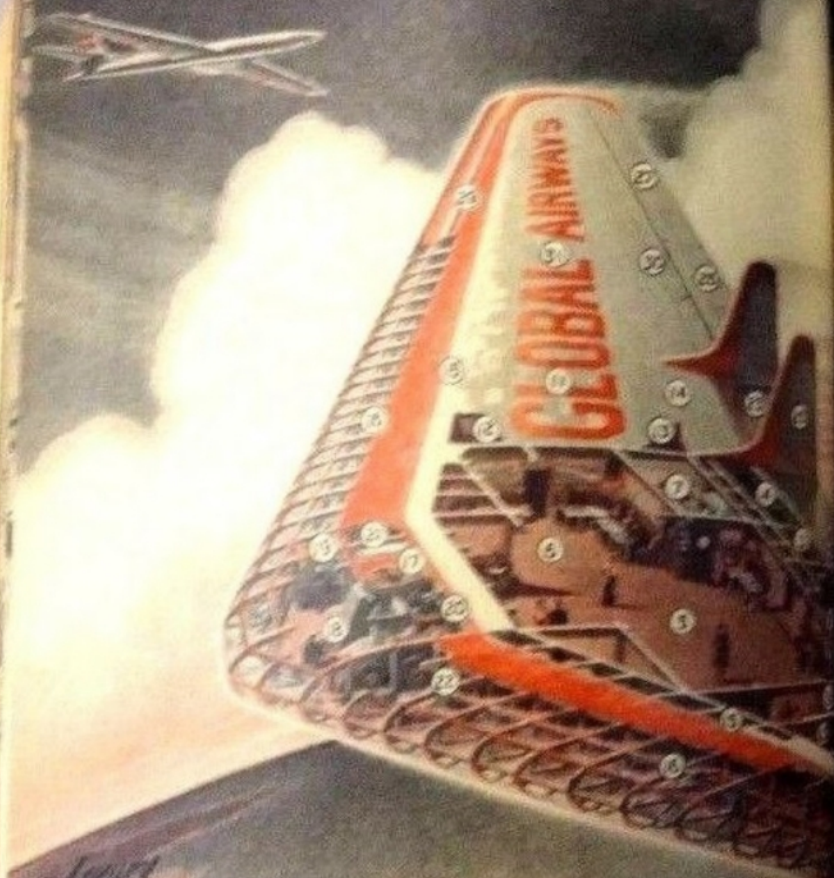
That's what's coming as soon as the war is ended. It's going to be a world filled with scientific and mechanical wonders such as you have never dreamed of!

Science in general makes more progress in a year of war than in a decade of peace. Major de Seversky says in his opening paragraph of the opening page.

Major de Seversky is correct. For MECHANIX ILLUSTRATED, inspired by the desire to make an exhaustive investigation of the marvels of progress being made during this war, what Mr. Conley has discovered makes me believe, the most amazing and thrilling series of stories we have ever read.

This series will cover the whole field of industry. It will start with an article in the October issue of MECHANIX ILLUSTRATED on "The Automobile of Tomorrow" and we promise you that the real facts contained in this story will be more thrilling than any other you've ever read. Don't fail to buy October MECHANIX ILLUSTRATED for "The Automobile of Tomorrow."

THE AIRPLANE OF TOMORROW



In a Giant Wing

continued...

"City of London" and the Purser greets her with a welcoming smile.

A moment later, he phones the "all passengers and crew aboard" to the bridge and relays an order to a waiting engineer. Instead of following Jill into the lounge, he leaves in the lower to

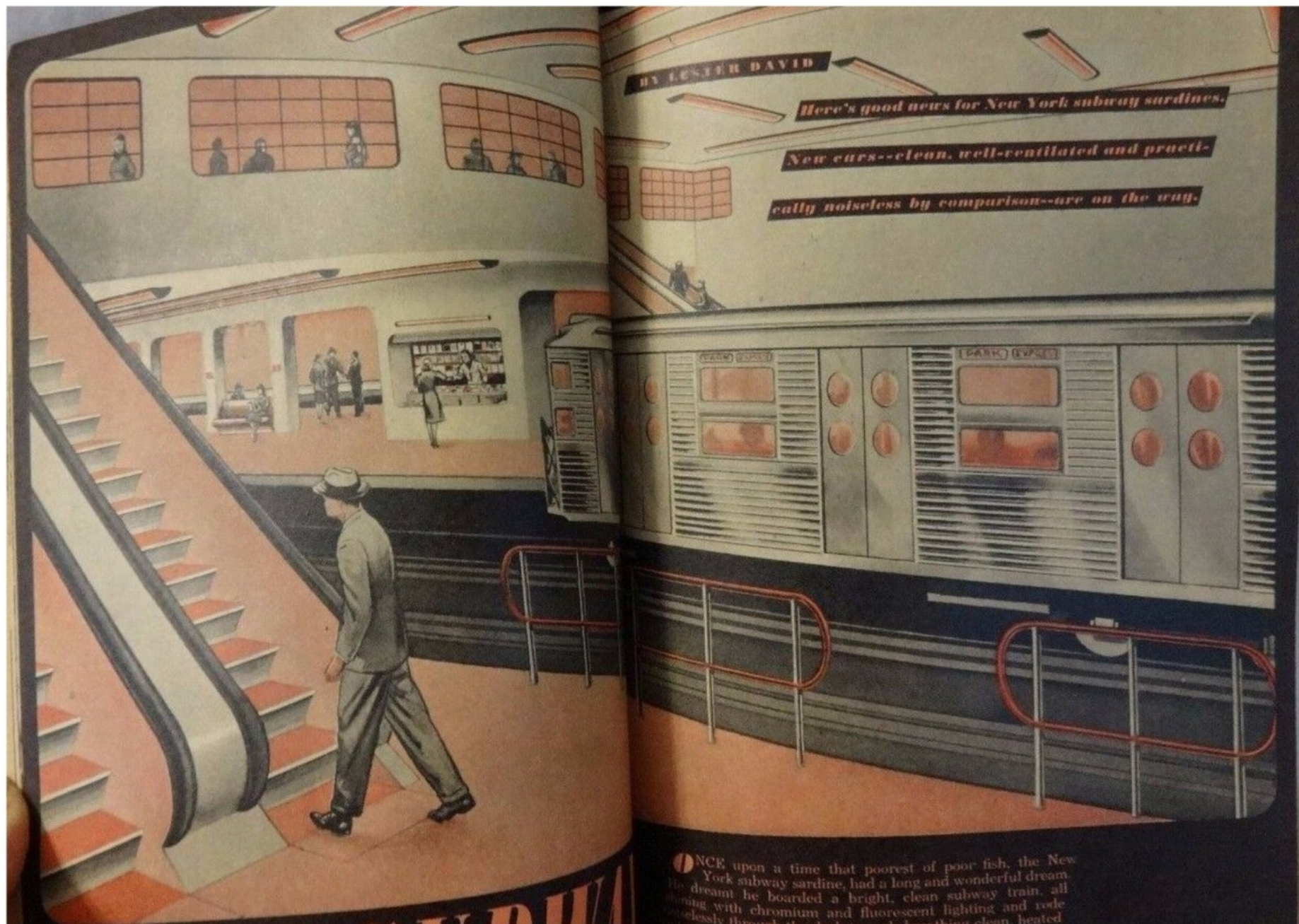
filing cabinet type of roller suspension arms, is drawn upward over the upper section on rails built into the upper section's side girders. As its roller-tired rollers drop off the top of the rails and lock, another pair of rollers swing the telescoped gangway up and



The leading edge is glazed in with double walls between which warm air is circulated to heat the promenade. Further back are reserved deck chairs.



Key—1: Retractable entrance gangway. 2: Foyer. 3: Purser's Office. 4: Baggage Room. 5: Main Lounge. 6: Grill. 7: Gallery. 8: Bar. 9: Men's Room. 10: Men's Smoking and Card Room. 11: Private Staterooms. 12: Powder Room. 13: Ladies' Room. 14: Rear Transverse Corridor. 15: Front Transverse Corridor. 16: Observation Deck. 17: Pilot. 18: Navigator. 19: Chief Engineer. 20: Captain. 21: Banks for relief crew. 22: Landing-gear (retracted). 23: Six jet engines in each wing. 24: Engine air intake scoops beneath wing. 25: Air Separator Flaps. 26: Elevons. 27: Tail and Rudder Flaps. 18: Wing Flaps. 19: Wing slats. 20: Boundary-layer control slats. 21: Multiple fuel tanks.



BY LESTER DAVID

Here's good news for New York subway sardines.

New cars--clean, well-ventilated and practically noiseless by comparison--are on the way.

ONCE upon a time that poorest of poor fish, the New York subway sardine, had a long and wonderful dream. He dreamt he boarded a bright, clean subway train, all shining with chromium and fluorescent lighting and rode noiselessly through the dark, cool, breathing clean, heated

Build a Pistol Crossbow

SCIENCE and MECHANICS

35¢ MARCH

**America's
Aerial
Foot Soldiers**



**Motorized
MOUNTAIN GOATS**

**How to Buy Them —
How to Build Them**



Tests on All Models

Cape Canaveral's Unsung Heroes



America's Aerial Foot Soldiers

Shades of Buck Rogers! America's foot slogging fighting men are flying

By ROSS R. OLNEY

MAN has been able to fly for 178 years, after only dreaming of it since time began. First he left the surface of the earth in a balloon then, 58 years ago, in an airplane. 21 years ago his flight became even more maneuverable and efficient with the invention of the helicopter. But man continued to dream and work. He wanted to fly alone, without gas bags, wings or rotors. Buck Rogers was doing it every day . . .

man could do it too.

On April 20, 1961, Harold M. Graham, a Bell rocket engineer, strapped an SRLD (Small Rocket Lift Device) on his back, unhooked the previously used tether and safety lines, and squeezed the throttle.

Astounded scientists and engineers, as they watched Graham lift into the air, knew that America's foot soldiers had a new, potent weapon, and that finally man was flying alone. Suddenly foot soldiers were no longer a captive of gravity. In land warfare they could rise over obstacles such as rivers, barbed wire or land mines. For amphibious,

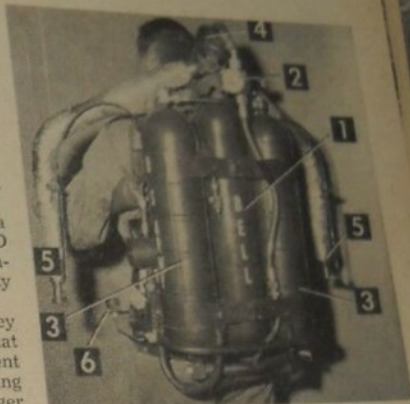


FIG. 1: Rear view of belt. 1, pressure tank; 2, regulator package; 3, hydrogen peroxide fuel tanks; 4, gas generator; 5, jet nozzles; 6, fuel pressure gauge.

Illustrated by Bill Wadkins



Aerial foot soldier in foreground is firing rocket bazooka from 9 stories up. Other soldiers are throwing grenades, or exchanging fire. One soldier fires on enemy plane as he rises in pre-calculated evasive action.

cosmic Caravel

Solar tradewinds may propel our silver sailed clipper ships of space on their interplanetary travels . . .



FIG. 1: Tender vessels are tethered behind the giant space sails for landing when the sail reaches its destination planet. Here, the crewmen of one tender slide down the towline and enter the cabin, preparatory to landing on Titan, one of Saturn's moons. The huge sail must not fall into the gravitational pull of a planet, since its construction is designed for the vacuum of space. The solar-powered tender will ferry supplies and personnel back and forth between the surface and the sail.

By FRANK TINSLEY

SINCE the beginning of recorded time, mankind has worshipped the Sun as King of the Heavens and the center of our solar system. Ancient days, the center of a great, bright sun, whose brilliance was thought to be a great, fiery God, whose eyes and blinded mortal aches, whose angry breath scorched the earth's deserts. Down through the ages, this concept of a burning deity has persisted right into the present century. For even today, the sun is still venerated as a divinity.

Enlightened man, however, knows the sun for what it really is—a great natural body of enormous potency, a colossal, ever burning, hydrogen bomb whose explosive "flares" control our environment, weather, and even our physical and mental well-being. He knows, too, that like all atomic bombs, the unending succession of solar explosions give off continuous waves of dynamic radiation. Expanding outward through space, this constant electrical flood carries a measurable force and has been dubbed by scientists, the "Solar Wind" or "Photon Breeze." While its impact is extremely small as compared with our earthly gales, about the weight of four cigarettes per acre, it is ample in the friction free, weightless vacuum of space, to drive a vehicle at constantly accelerating speeds.

The possibility of harnessing this great natural force was conceived by Dr. Theodore P. Cotter of the Los Angeles Atomic Research Laboratories. Dr. Cotter, an old sailboat hand and long familiar with the management of wind and canvas, envisioned a vessel with a gossamer like "sail" of plastic film, coated with a shiny surface of evaporated aluminum. He calculates that a circular sail some 50 yards in diameter and weighing about 25 pounds, is sufficient to propel itself and another 25 pounds of hull and payload. His first thought was to rocket a small vehicle to this weight into space and at its apogee, spin it to spread its sail by centrifugal force. This project, based on today's limited booster

capabilities, would prove his theories. In later, larger ships, planned for assembly in orbit, Dr. Cotter envisions a sail supporting framework of airtight plastic tubes, stiffened after inflation by a filler of lightweight foamed plastic. After setting, this structure of radi-

(Continued on page 126)



FIG. 2: Revolving endlessly on its gimbals, the Caravel's wheel-shaped hull generates a carefully calculated centrifugal pull and provides the ship with artificial, earth-like gravity. The outer "tread" thus becomes the floor of a circle of cabins, labs, workshops and public rooms. Greenhouses ring the sunny side of the hull and a protected promenade deck encircles its shady side. Passages thread the spokes, center hub and gimbal rings, permitting access to the sail and tow rockets. 1, rotating hull contains living quarters. 2, encircling yoke permits hull to tilt in any direction. 3, vertical ring swings to permit tilting in any direction. 4, observation domes for inspection. 5, inflated fabric tubing stiffens the huge sail area and supports rigging. 6, attachment points for the ring of towing cables. Algae in the greenhouse will produce oxygen and absorb carbon dioxide, and feed will be grown in hydroponic gardens in endless rotation to feed the crew on long journeys.

New Land-Sea-Air



Above, the author's sketch of a biplane, which is the Berlin version of the new land-sea-air plane.

• THE airplane of the future, in the striking and unusual form presented at the recent exposition in Berlin, which is reproduced on these two pages, is a step is taken toward the machine, around machine, capable of doing what he desires. Some of these experiments have not stood the actual test of time and the travel problem they will create; but they show the trend which airplane design will take in the next few years.

The photograph reproduced in the center of this page, and taken at the center of this page, and taken at the center of this page, shows the "Amphi-Biplane" which, running on three wheels, its wings folded (as shown in the photograph reproduced below) can travel as fast as a normal automobile. The stream-lined body will permit of considerable speed. The machine holds four passengers. The machine has a cooled two-cycle motor, which drives either the wheels or the vertical propeller shaft. Steering is done by a wheel, as in the ordinary car. As a suitable open place for a motor is found, the driver opens the folded propeller above the machine.

It will be observed that the machine has a small vertical propeller up the center of the fuselage, which, when the machine is in the air, is folded up.

Universal Vehicles



The change in all-around travel is represented by the little outboard machines pictured here. Right, the actual "Week-End Amphibian," which attracted great interest at Berlin. (Globe Photo.)



By WILHELM SCHRAGE (BERLIN)

depends for its forward propulsion. This is the Voith-Schneider method, now in use in Germany; the warping of these surfaces also determines the direction of flight, eliminating the rudder as well. How satisfactory it will be in a machine of this type is to be seen.

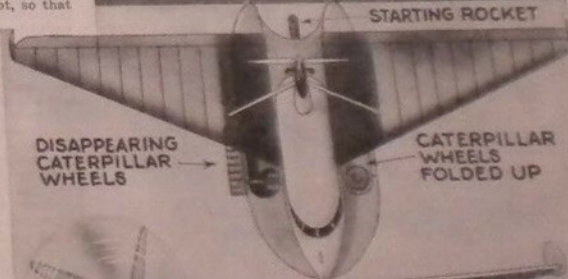
The weight of the machine is 1,000 pounds, and of the load 1,000 pounds, providing for four passengers; total flying weight, 2,000 pounds (900 kilograms).

Equally interesting, though even further from commercial perfection, is the "Week-End" amphibian plane shown at the right, which was also a noteworthy feature of the exposition. The model as exhibited is pictured, showing its body, hinged wings and elevated propeller. Beneath is the engineer's drawing showing a proposed adaptation to travel over land as well.

The machine illustrated is, as yet, only an experimental model, it is true, and hardly practical. Yet it indicates what may be expected when it is perfected for all-around travel. The cabin has room for three people; its upholstered seats are folding beds for night use. The passengers sit higher than the pilot, so that they can see better in all directions. The wing span is 50 feet, the length of the machine, over all 25 feet, and the height 9 feet, eight inches. The model exhibited, in silver and blue, was quite conspicuous.

Interesting as it is to all experts, this machine has not actually flown, being exhibited motorless. The design published provides for two 150-horsepower Diesel motors, placed behind the passenger cabin, and utilizing as a radiator the column which carries the four-bladed propeller. The tanks for fuel (crude oil) are built into the wings; the angle of the latter has been adopted to give better balance when the craft is afloat.

To start from the water is now conventional, but this machine carries on each side overland propelling mechanism, similar to that in use for tanks, and driven by a worm-gear. These wheels are hinged, as



\$10.50

A description of the machine, which is the Berlin version of the new land-sea-air plane.

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Aero-Electric Power

By HANS F. KUTSCHBACH*

• UNLIMITED power from a source hitherto untapped is available, according to the plans of the distinguished German engineer, Hermann Hönner, well known as an erector of towers for radio purposes. The proposal is shown here in its most complete development.

Before this, Herr Hönner had published the idea of giant turbines, supported on a steel tower in the suburbs of a city, and reproduced in the June, 1932, issue of this magazine. The same idea was then extended to a floating power plant, with twin, barge-like hulls, between which a framework bore aloft two wind wheels.

His latest plan, however, is that illustrated here: a single wheel, of even larger size, is supported above hulls which may be obtained from obsolete liners or warships, instead of breaking them up for steel. The wheel may be more than five hundred feet in diameter; its oblique blades, at an angle to the wind, produce a rotational component of motion which will turn the wheel $7\frac{1}{2}$ times a minute. At the hub (instead of in the rim, as in previous designs) are located the elements of the generators of electricity. On one or both of the hulls are power rooms, where necessary preliminaries for distribution are effected. A submarine cable runs through the anchor ring (to prevent strain upon it through the motion of the hulls) and thence to the shore. It is now possible to insulate more than 100,000 volts of alternating current, by use of oil in the cable.

(Continued on page 22)

*Berlin, Germany.



WING-SHIFT PLANE for High and Low Speeds

WINGS EXTENDING
AUTOMATICALLY
AS PLANE DIVES

EXTENSION WING
ROLLED UP

WINGS
EXTENDED

GERIN PLANE
MODEL AS
WORKED OUT
BY AERO-
DYNAMIC
TESTS

HOLLOW WING
STRUCTURE BUILT
UP OF DURALUMIN
UNITS WITH
CENTRAL SLOT

EXTENSION SURFACE TRAVELS IN
THIS SLOT, EXTENDING THROUGH
HINGED TRAILING EDGE OF WING

AT HIGH CRUISING
SPEED, WING SURFACE IS
REDUCED TO MINIMUM

By FLETCHER PRATT*

● A monster flying boat for twenty passengers, which will soar through the skies at 217 miles an hour, and which employs the novel principle of wings with variable surfaces, has received the approval of the French Air Ministry and, as soon as the experimental machine embodying the same principles, now building, has passed its flying tests, will be placed under construction.

The airplane with variable wing surfaces—a dream which has excited airplane designers ever since the days when the first Caudrons appeared with their floppy trailing edges—seems at last on the point of realization. Its success is due to the inspiration of Jacques Gerin, French war aviator and holder of the Medaille Militaire, who has attacked the problem from a new angle and produced a machine as startlingly original as the first autogyro.

Exhaustive wind-tunnel (Continued on page 92)

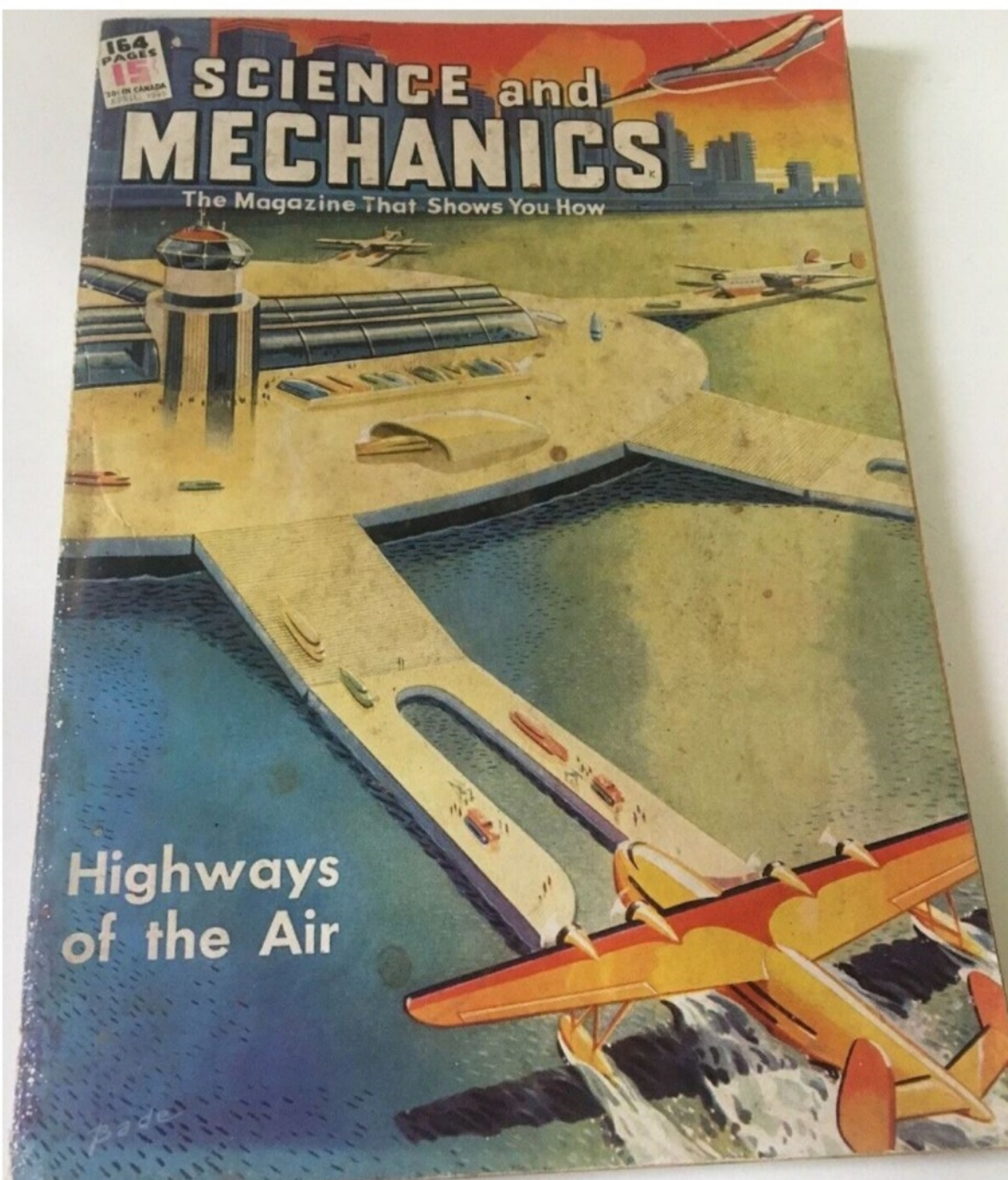
*Paris Correspondent, *Everyday Science and Mechanics*.

164
PAGES
15¢
30¢ IN CANADA
APRIL 1960

SCIENCE and MECHANICS

The Magazine That Shows You How

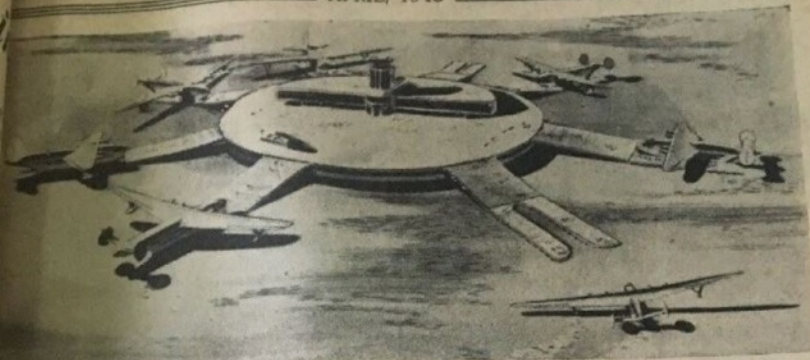
Highways
of the Air



SCIENCE and MECHANICS

The Magazine That Shows You How

APRIL, 1945



Based on the belief that seaplanes offer America a quick advantage in world trade immediately after the war, here is a design for a high-traffic flying boat terminal for a large city. (The Glenn L. Martin Co. photo)

Highways of the Air

By MAURICE RODDY

THERE'S an old saying that you can't fly on one wing, and it's equally true that you can't fly without airports, for adequate ground facilities are the foundation of all aviation. However, it is only now—as an air-minded nation eyes post-victory flying—that this fact has made itself felt.

According to W. T. Piper, frequently described as the "Henry Ford of aviation," landing areas are as essential to aircraft as harbors are to boats and good roads are to automobiles. Piper is also convinced that private flying will contribute to the greatest expansion of post-war aviation because of its yet untouched mass market possibilities.

Pointing to America's present total of 25,000 civilian aircraft, the Civil Aeronautics Administration estimates that there will be 400,000 civil planes in the United States within ten years of the

This design is in the shape of a pier with floating tidal docks for loading and unloading.

(The Glenn L. Martin Co. photo)



YESTERDAY'S fragile, single-seat helicopter is fast becoming a revolving-wing giant! The largest specimen yet to fan its way into the skies was unveiled recently at the British Aircraft Constructors' show at Farnborough, England. It's the Cierva W-11 Iron Horse, with three rotors driven by a single Rolls-Royce Merlin engine.

But we're going to beat that! On the planning board of our Piasecki Helicopter Corporation is a pinwheel to end all pinwheels. This XH-16 is twin-rotored and all metal, as large as a DC-4, with a detachable freight or passenger carrier comparable to a Greyhound bus. The passenger capacity has not yet been revealed, but it is estimated at 50 military or 70 civilians. The passenger cabin attached to the craft's belly can be replaced quickly to speed up loading and unloading operations. Its most efficient use in war will be as an air ambulance.

When will it fly? In two years, Piasecki says.

PIASECKI

CIERVA

SIKORSKY

Cierva W-11, the largest, but Piasecki's XH-16 is the most modern.

XH-16



MA
SOA

EVERY
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MECHANIX ILLUSTRATED

A FAWCETT MAGAZINE

JUNE
15^C



World's Largest Airliner
Model 37 to Carry 204 Passengers

7TH WAR LOAN

SEE PAGE 140... A LETTER
TO YOU FROM THE GEN-
ERALS OF THE ARMIES AND
THE ADMIRALS OF THE FLEET

BUY BONDS!

NEW YORK-LONDON 9 HOURS

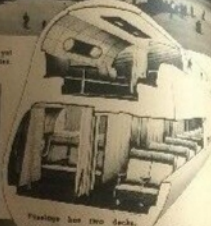
Model 37, Clipper, fastest and largest airliner yet
designed, will represent U. S. in world air routes.



Lounge has wood paneling, recessed lighting.

FIFTEEN huge Consolidated Vultee Model 37 airliners will fly the new Pan American Airways after the war. These Clippers, soon to be under construction, will dwarf all existing planes of their type in size, power, speed, range and cargo capacity.

The Model 37's payload will be 25 tons, including 204 passengers and 74 tons of baggage, and its cruising speed will vary between 310 and 342 miles per hour over a total range of 4,200 miles. Its wing span of 220 feet will be almost 30 feet more than that of the B-25 Superfortress. Six engines of a design now (Continued on page 144)



Dining has two decks, will carry 204 passengers.

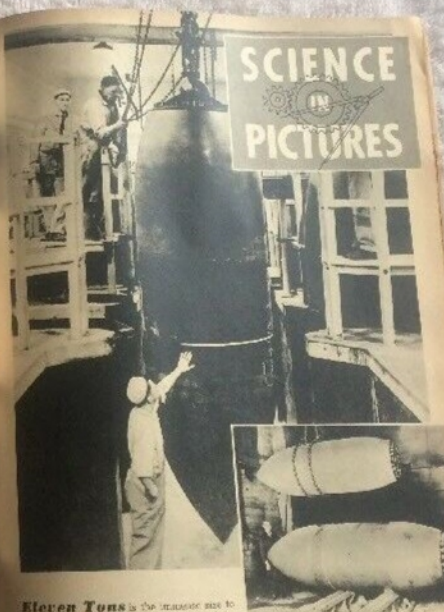


Bedrooms on upper deck have bathroom appointments.

14

Mechanix Illustrated

SCIENCE IN PICTURES



Eleven Tons is the massive size to which the Royal Air Force has developed the aerial bombs it drops on Germany. Larger picture shows workmen carrying one of the explosion line in a British factory. In the smaller picture, the giant new bomb hangs from the 8-tonner with which it is compared.

The 22,000 pounder was used with devastating effect to knock off Nazi resistance. The official British photo was released from London to New York.

June, 1945

SCIENCE
OF MECHANICS

SCIENCE & MECHANICS

FALL 1981

AUTOMOTIVE:

- Pro's and Cons of Water Injection
- Replacement Parts at Bargain Prices

HOW-TO:

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EARTHQUAKES:
NEW METHODS
OF PREDICTION

ARTIFICIAL HEART:
LATEST
MEDICAL MARVEL



A DAVIS PUBLICATION

SCIENCE
& MECHANICS

SCIENCE & MECHANICS

FALL 1981

NASA's
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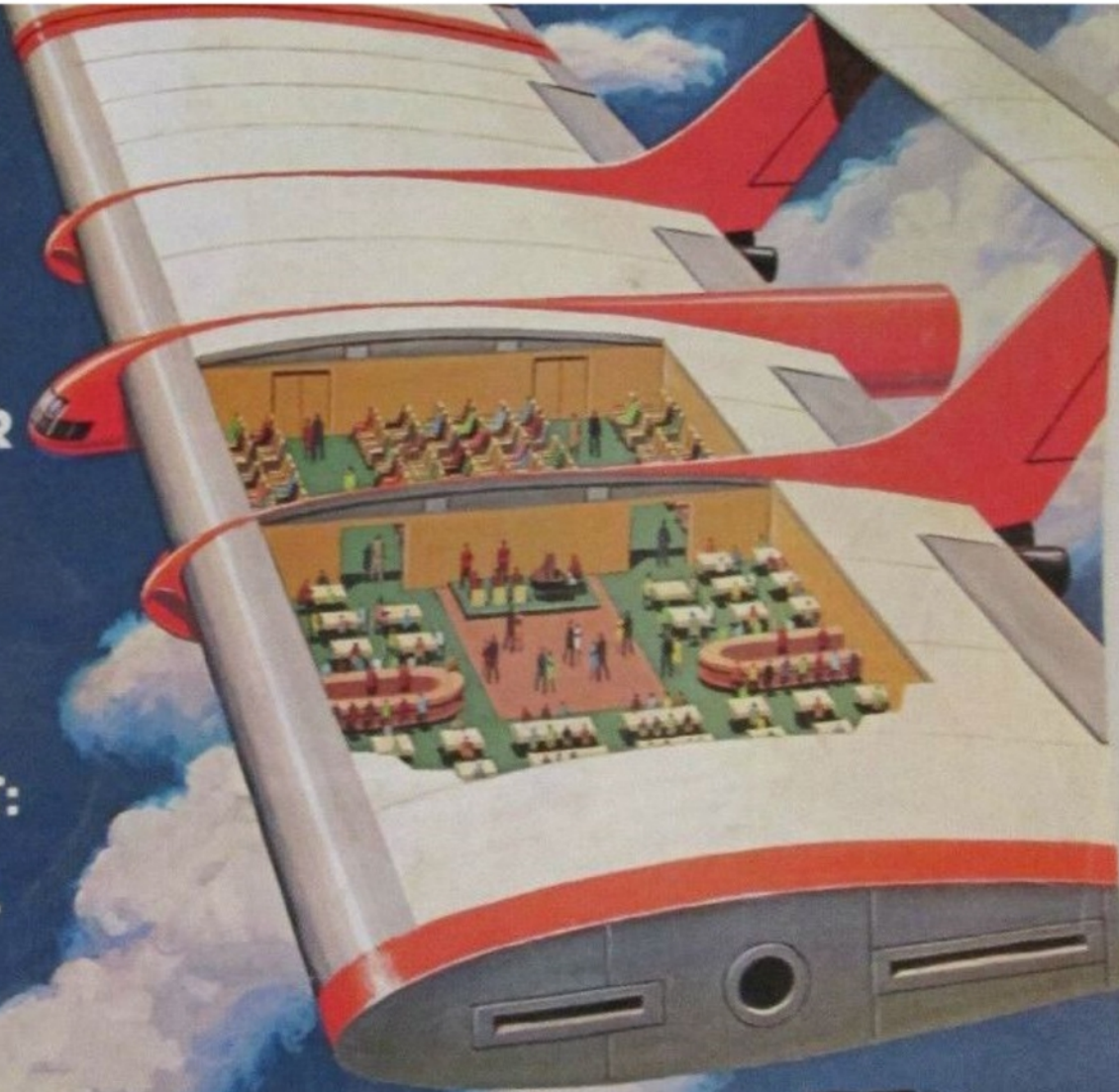


AIRPORT IN THE SKY!

HOME COMPUTER
INFORMATION
SERVICES

EARTHQUAKES:
NEW METHODS
OF PREDICTION

ARTIFICIAL HEART:
LATEST
MEDICAL MARVEL



Harvard

A DAVIS PUBLICATION



MECHANIX ILLUSTRATED

A FAWCETT MAGAZINE

SEPTEMBER
15c

FIRST PHOTOGRAPH OF
THE NEW DE BOTHEZAT
CO-AXIAL HELICOPTER



WE BATTLED NAZI TANKS

BY CORP. S. A. DAVIS
SEE PAGE 35



Breguet transatlantic helicopter, based on diagrams of original design. Speed planned was more than 5 miles a minute, ceiling near 20,000 feet, total load 15 tons.

The helicopters portrayed on these pages are based on actual designs by leading pioneers of rotary-wing aircraft throughout the world. At the center of these pages is published for the first time a drawing, based on an original sketch by the inventor, E. Burke Wilford, of a helicopter with a jet-propelled and counter-balanced rotor. A giant Breguet transatlantic ship was in the engineering stage when war broke out. Helicopters similar to the smaller ships have already been tested.



Forward-rotor helicopter, a variation from blueprint of Wilford, President of Pease Aircraft Associates, Ltd. May slipstream 100 passengers. Price \$25,000. It will be built.

Mechanix Illustrated Art by Fred Ripporda



Helicopter test on Focke-Wulf lines. Focke-Wulf helicopter held duration record until Igor Sikorsky set new one. Rotors are fixed to provide forward motion.



Wilford helicopter-flying-wing transport. Single-bladed rotor is jet-propelled, blowers housed in wing. Rotor speed of 500 m.p.h. or more would make jet-propulsion efficient, eliminate torque. Travelling forward, rotor stops, points inward as stabilizer while props drive ship.

De Botheau heli-bop, flying motorbike of tomorrow. Small motor of 25 or 35 h.p. to be used in single series. Fly it from rooftop.



Miracles

You'll Live To See

MI
SPECIAL FEATURES



That "new world of the future" really is just around the corner. Here's what it promises you.

By Lester David

DOCTORS can find a cure for cancer. Engineers can perfect a one-hour plane to London. Scientists can solve the riddle of the flying saucers.

Pipe dreams? Not at all. Scientists of national renown tell you that the brains and the know-how are available—right now—to get the answers to these and other dark mysteries that puzzle mankind. And there is a sound reason for this confidence that miracles are a-borning. Here it is:

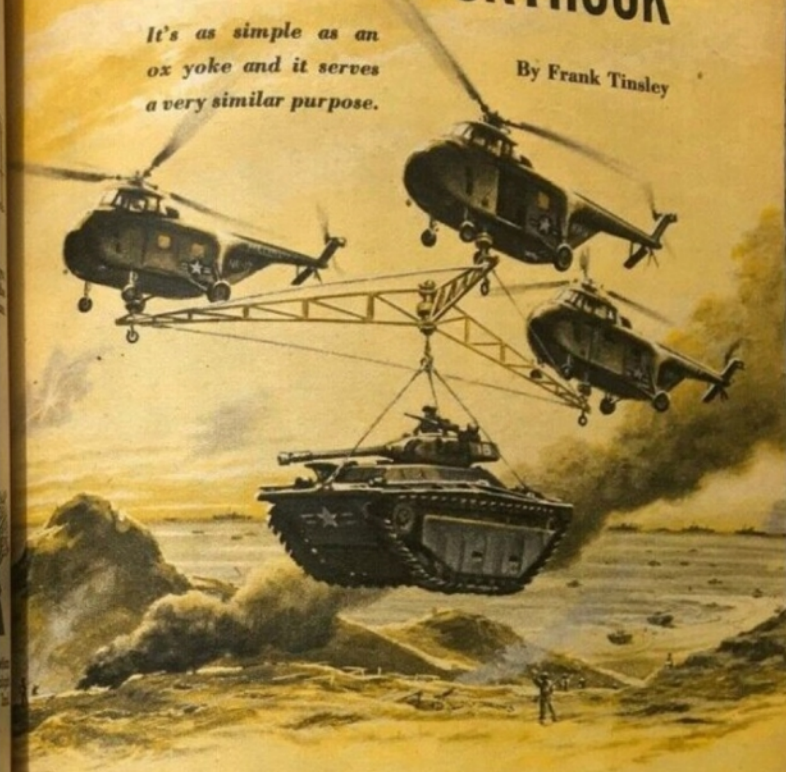
Within the past few years there has been an almost unbelievable upsurge in the number and importance of government and private research

49

TRICOPTER SKYHOOK

It's as simple as an ox yoke and it serves a very similar purpose.

By Frank Tinsley



WHEN a heavy hauling job comes up the idea has always been "Put in more horses." Now, Raymond A. Young, an ex-Navy aeronautical engineer, has made it possible to harness helicopters in teams. His harness, as uncomplicated as an ox yoke, is a tubular framework that holds the working whirlybirds far enough apart to give them rotor room. Various adaptations of Young's basic idea may be used. The one illustrated is a tricopter harness consisting of three girders hinged to a central vertical hoist

and braced in a rigid triangle by steel cables. Above the outer end of each girder is a universal coupling which attaches to the bottom of a helicopter with a quick release fastening. Each of the machines is separately flown but all follow the commands of a chief pilot, given over interphones. Young's multi-copter harness can pick up bridge sections, ferry vehicles and equipment, emplace artillery in otherwise inaccessible positions—using standard copters instead of expensive specialized equipment. •

63

MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

25¢
FEB.



MI'S TRACTOR-TRAILER HOUSEBOAT

See Page 84



9 5 2006

McCAHILL TESTS THE SENSATIONAL NEW

THERE'S A FORTUNE WAIT

0754

0507143
A J SCHROEDER
2

MI's TRACTOR-TRAILER



Two 165-hp diesels pull connected units at about 15 mph or push powerboat alone at 30 mph. When Pap wants to go fishing, he simply uncouples powerboat and takes it.

HOUSEBOAT

It combines a plush-lined houseboat that will win the little woman's heart and a handy sport-fisherman-type craft for you.

By David Lockhart

ARE you frustrated by a Living Doll who refuses to go boating in anything less spacious than a mobile penthouse or a scaled-down Cristoforo Colombo? On the other hand, do you yearn for a fast, rugged little powerboat to take you fishing to an isolated duck blind, or even to a stuffy office? Well, if your hip pocket can stand the financial rap, here is your answer.

This design combines a plush-lined houseboat fit to win the heart of the most land-locked Little Woman, and a handy sport-fisherman type craft for you. The 50'x13' houseboat and the 35'x13' powerboat couple together into one unit, 80 feet long and articulated like a Pullman train. You might name them His and Hers . . . or Mack and Fruehof . . . or even Mutt and Jeff.

Moor the houseboat in some cozy cove, preferably midway between your favorite fishing spot and your wife's pet hairdresser, and you have a summer home with a ready-made swimming pool and no grass to cut. You will be commuting to the grindstone all week in the powerboat and using it weekends for fishing, or water-skiing maybe.

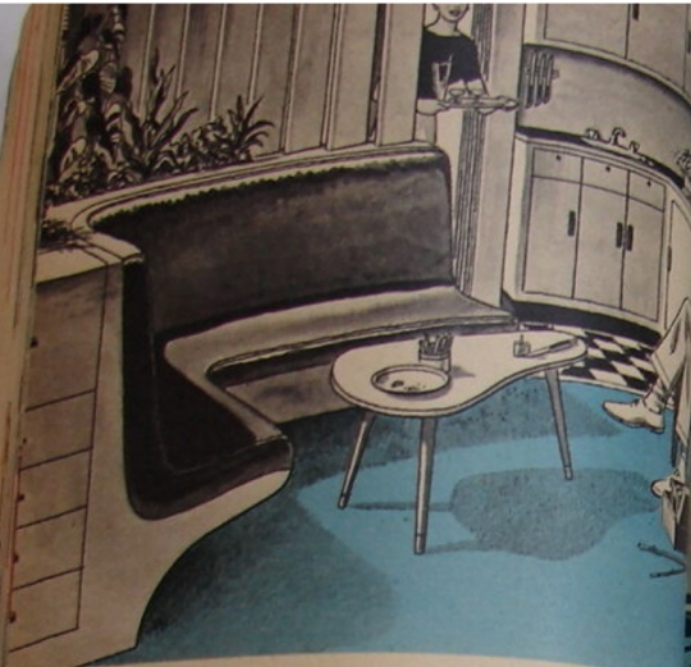
And when the leaves come tumbling down, tool the whole rig down to Florida and tuck the houseboat away in some palm-fringed lagoon where your doll can wallow the days away in sun-dappled water or in wall-to-wall slothfulness while you charge out to the Gulf Stream in the power job in quest of the matchless marlin.

When you return, bloody but unbathed, a tiled shower and a full-size inner-spring mattress may look pretty good even to you.

The powerboat is quite conventional except for a concave transom to match the semicircular bow of the houseboat. There are cabin-house controls as well as a flying bridge. The forward trunk cabin could accommodate a paid hand or an extra guest. There are minimum galley arrangements for heating soup and coffee and keeping the beer cold on the fishing forays. Opposite the galley counter is the lavatory.

Two 165 hp diesels pull the whole rig at about 15 mph or push the powerboat alone at 30 mph. Variable pitch propellers might be used to advantage for greater bite when in tow. The exhaust is piped out the top of the hollow mast in deference to the houseboat passengers.

The occasional reversing that may be necessary employs techniques dear to the heart of every trailer fan. For any pinpoint backing, the powerboat uncouples, circles and makes fast alongside the houseboat.



Sumptuous and spacious main cabin can be shut off from galley area by means of a sliding door.

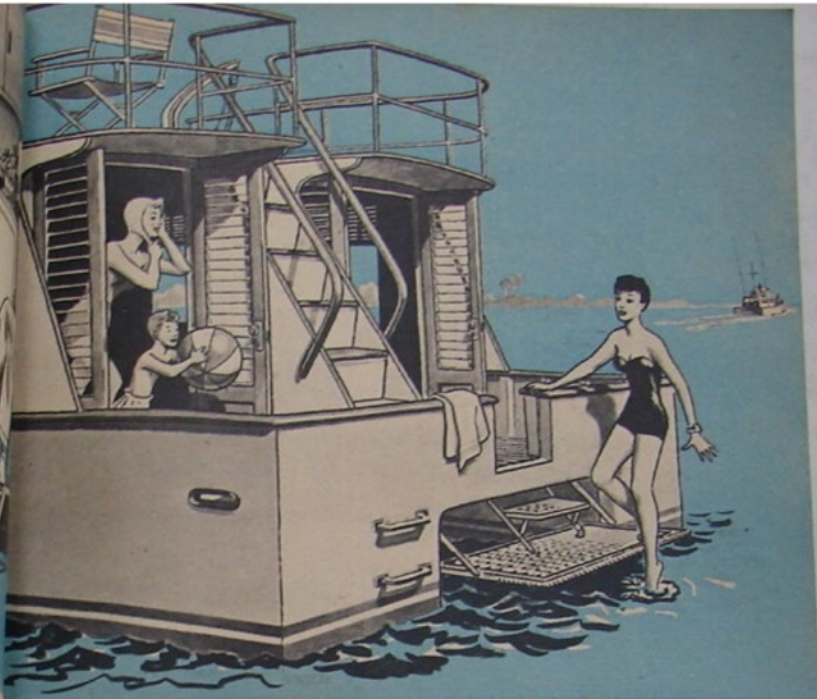
Moored in some cozy cove you have an ideal summer home.

off both halves of the galley. Or, if the mood is convivial, the board half containing sink and refrigerator can be left open to serve as a bar—it's a view that is never offensive.

A built-in lounge unit divides the cabin, with vertical louvers turning off the sight but not the ventilation of the cooking area. An angle of the unit houses a desk. A dining table sets up in front of the lounge with places for eight persons and a coffee table can be substituted between meals.

House plant containers built into the back of the lounge unit and an honest-to-goodness fireplace in the after bulkhead of the cabin should make things about as homey as any split-level, ranch-type house your wren could find.

Double glass doors flank either side of the fireplace and open to the afterdeck where fireplace fuel is stowed under the sun deck.

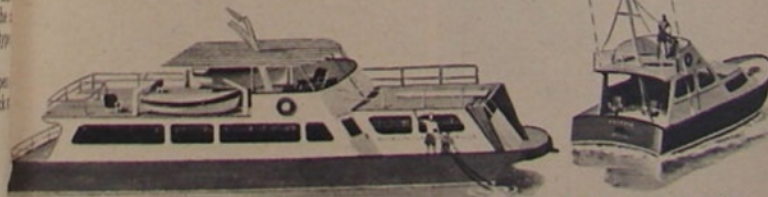


When luxurious craft is anchored during summer months you just dive off stern to go for a swim.

with a ready-made swimming pool and no grass to cut.

way. A bulwark gate in the center of the transom leads down to a swimming and boarding stage. Under way the stage folds forward and up, to stow against the top of the tunnel between the hulls of the houseboat.

A wind-dodger spans the forward end of the sun deck with a gate leading forward, across the gangway when in [Continued on page 199]



February, 1955

Mechanics

NEW SUPER DIRIGIBLE DESIGNED FOR WORLD TRAVEL

The world's outstanding authority on lighter-than-air craft gives you an exclusive behind-the-scenes look at Goodyear's plans to bring the safest, least expensive and most comfortable long-distance air transportation back into the skies.

The passenger accommodations of Goodyear's proposed luxury liner include ship-size public rooms, wide promenades, balconies and two decks of spacious, outside cabins. 1: Control car. 2: Pilot house. 3: Navigation bridge. 4: A-Deck smoking room lounge. 5: Service bar. 6: Lavatories. 7: Stairs to B-Deck. 8: Forward transverse gangway. 9: Purser's office. 10: Doctor's office and sick bay. 11: Fore and aft gangway on either side of ship. 12: B-Deck starboard cabins. 13: Port cabins. 14: Ship's officers' mess. 15: Crew's mess. 16: Galley. 17: Pantry. 18: Main dining room lounge. 19: Passenger bar. 20: Promenade deck on either side of ship. 21: Stairs from promenades to C-Deck. 22: Balconies overlooking promenade decks and lounge. 23: C-Deck cabins. 24: Main frames. 25: Intermediate frames. 26: Tie-bars. 27: Gas cells.

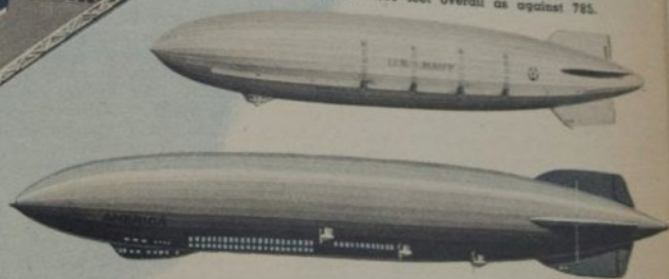
BY C. E. ROSENDAHL,
Vice Admiral, U.S. Navy, Retired
as told to WILLIAM WINTER

Below: About a third larger than the old Akron and Macon (top) the projected dirigible (bottom) has a lifting capacity of 10,000,000 cubic feet of sale, non-inflammable helium gas, as against the navy ships' 6,500,000. She is longer than her predecessors—350 feet overall as against 785.

TWO hours out of the port whose name she bore, the thousand-foot liner *New York* slid smoothly through the dark toward London, only a day and another night away. Lashed by the fall storm, less fortunate vessels wallowed through high seas. On the *New York*, passengers slumbered in spacious staterooms and a piano tinkled softly in the lounge. In the bar, a business man picked up his drink, turned to his companion and said, "Amazing, these dirigibles. Not even a ripple in

a glass. I remember one crossing in 1949—you recall how rough those surface crossings could get—when . . .

Day dreaming? Well, not exactly. The Goodyear Rubber Company is interested in plans for a 10,000,000 cubic-foot dirigible, a monster that would have a 35% greater helium capacity than the old *Macon* or the *Akron*. Nine hundred and fifty feet long, 142 feet in diameter, with a cruising range of 7,000 miles on its six 1,050 horsepower engines, the new super-



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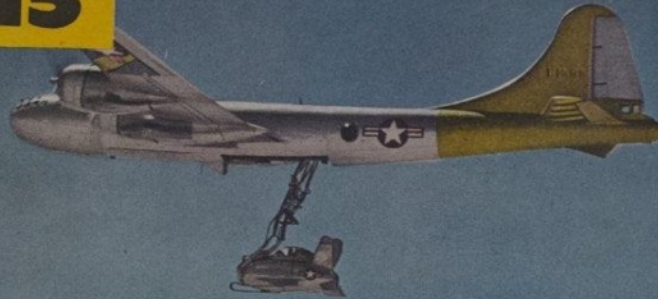
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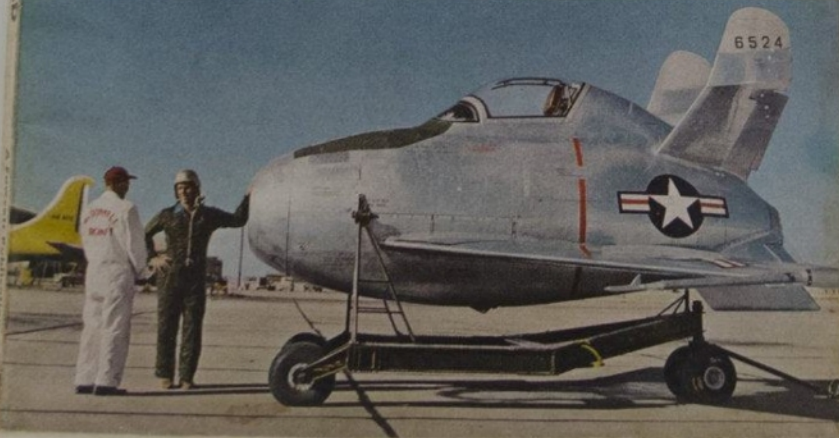
MECHANIX ILLUSTRATED

15¢

JUNE



KANGAROO BOMBER CARRIES FIGHTER IN ITS POUCH
First Color Photos of New Jet Trapeze Plane



MONORAILROAD TRAIN

... jet-powered

WHEN certain designs now in the drawing-board stage are finally completed, you may find yourself whizzing cross-country at over 400 mph in a super "El." Combine the speed of an airliner, the safety of a trolley and the comfort of a Pullman—and you've got the formula for this revolutionary, suspended monorailroad, powered by jets.

The single-railed train could hurtle from coast-to-coast in less than 10 hours. Two jet engines, with auxiliary rockets or Jato units, would do the trick.

Over 100 passengers would be carried in one three-coach train, making only one stop for refueling at the halfway point. The coaches would be pressurized, air-conditioned and over-equipped with safety belts for whisking down mountains. Overhead rail-grippers would be suspended on stanchions dotted across the nation in a New York to California system. •

SEE CROSS-SECTION OF RAIL-GRIP SLIPPERS

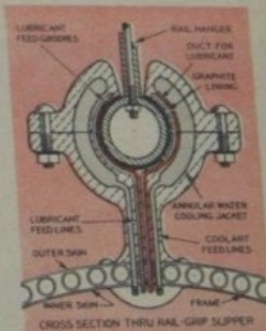
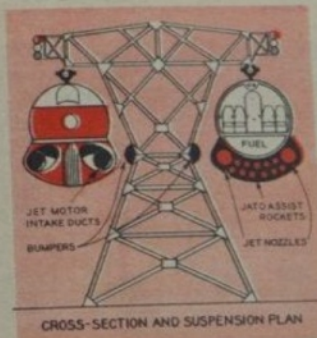
TUBULAR MONORAIL

FRICTION BRAKE

JET ENGINE INTAKE DUCTS

BUMPER

DOUGLAS ROUSE



Two powerful jet engines with auxiliary solid fuel rockets or Jato units for help in starting and climbing would be used.

All-weather, rail-gripping slippers would be water or Prestone-cooled and lubricated under pressure.



Satellites may be forerunners of Von Braun's famed space stations. A. Liquid rocket

By O. O. Binder

The Mouse

Orbiting around the earth at the fantastic speed of 18,000 mph, the first space satellite will herald the beginning of a new era in 1957.

IN 1957 or 1958 you may glimpse a rapidly moving "star" that, contrary to all other celestial bodies, will rise in the west and set in the east, moving far faster than earth's rotation. You will see it (if you are sharp-eyed) only at dawn or dusk, and in seven brief minutes it will streak clear across the heavens from horizon to horizon. Its speed

will be over 18,000 miles per hour. This man-made star will be the first Space Satellite, dubbed the MOUSE (Minimum Orbital Unmanned Satellite Earth) by Dr. S. Fred Singer of the University of Maryland. About the size of a basketball, the MOUSE will circle the earth between 200 and 300 miles high once every 90 minutes.

None of this is speculation anymore of course. Since President Eisenhower's dramatic announcement last August, the U.S. Department of Defense has announced a \$2,000,000 contract with the Glenn L. Martin Co. to construct launching vehicles. General Electric has been chosen to make the rocket



lunar landings. B. Nuclear long-range space ship. C. Stuhlinger's ion-electron rockets.

That Will Change Your Life

motors. Under the code name Project Vanguard scientific personnel are already preparing for S-Day—Space Day—within two years.

Thus, each citizen of the U. S. is now investing in this new venture and paying for it via taxes. The cost of these experimental baby space stations will be comparatively low, estimated around \$10,000,000 each. But at least half a dozen will be tried according to one government spokesman. Add to this all research, monitor stations, ground equipment and personnel and the cost will undoubtedly double or triple.

What will these earth satellites actually be like? How will they

get up? What jobs will they do?

Best guesses, in lieu of official government data not yet released, are that each will begin as a three-stage rocket device standing 150 feet high and 30 feet wide at the base, in the shape of a tall tapering cone. The multiple rocket will be shot up from the coast, slightly tilted to go over the ocean so that when its first two stages burn out and drop off, they will fall into open sea without danger.

The final stage—the satellite itself—will reach a height of 200-plus miles, where guide rockets will then turn it into its precise orbit around the world. The entire flight will take less than one hour.

Illustrations courtesy SPARKS/NOVA, Smithsonian Institution, and Robert Reed Corp.

ATOMIC DUSTER

...Deadliest Weapon



Silently criss-crossing a 100-mile circle, the deadly weapon sprays its invisible radiation dust in the curious pattern above. Bull's-eye of target gets heaviest dose of radioactivity.



Everything still looks normal that first night while the Atomic Duster circles above the city.



Several days later, people start bleeding to death in the streets—victims of atomic dusting.

Fog of death radiates from the radioactive missile as its nuclear engine whips it at supersonic speed over the enemy's city.

By Frank Tinsley

THE sudden swirl of snow high on a wind-swept Alaskan peak may doom a key city half-way around the world. For that swirling snow may unveil the most fearful weapon ever to terrorize a people—the Atomic Duster.

The snow whirls upward on the slope as a hidden hangar door opens and reveals a strange, red-winged missile down into a concrete pit on a big dolly. In the twilight of the first day of that dreaded World War III, shielded flashlights are probing the dark shadows in the pit as the parka-clad crew muscles

New York's Rubber Subway

HOW would you like to shuttle across town in a quiet, vibrationless subway train that rides smoothly on an endless rubber conveyor belt?

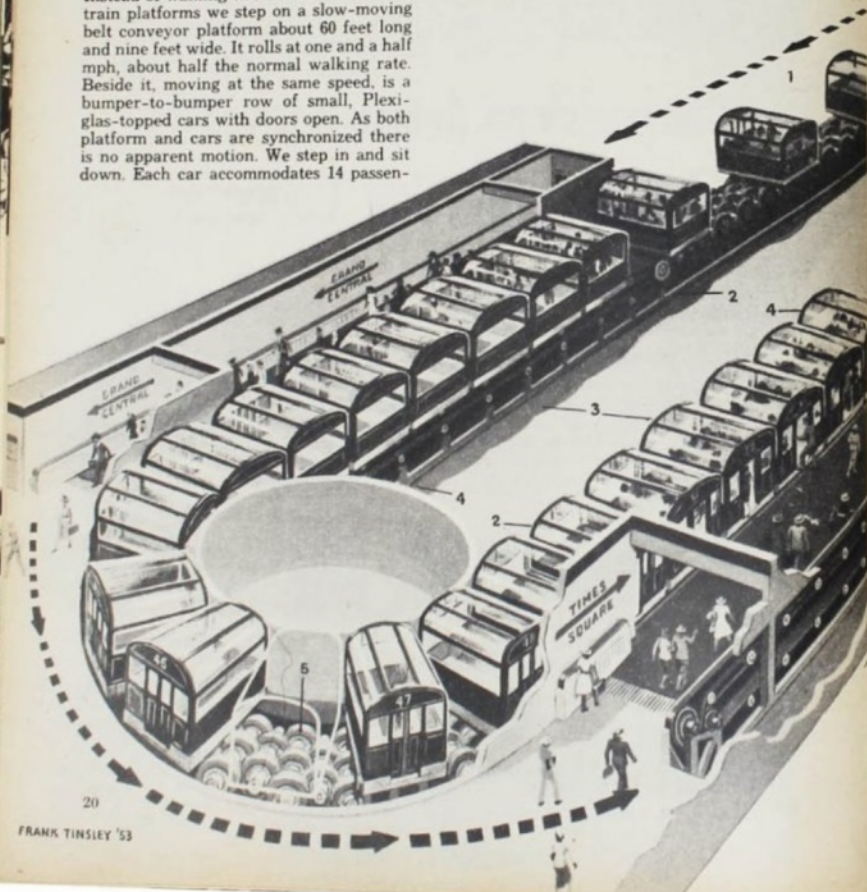
Sidney Bingham, chairman of the Board of Transportation in New York City, would, so he and a group of engineers devised the following plan estimated at \$3,800,000, which is \$1,700,000 less than the cost to modernize the present system.

Let's take a ride and see what it's like.

Starting at Grand Central subway station we walk to the Times Square shuttle. Instead of walking two blocks to reach the train platforms we step on a slow-moving belt conveyor platform about 60 feet long and nine feet wide. It rolls at one and a half mph, about half the normal walking rate. Beside it, moving at the same speed, is a bumper-to-bumper row of small, Plexiglas-topped cars with doors open. As both platform and cars are synchronized there is no apparent motion. We step in and sit down. Each car accommodates 14 passen-

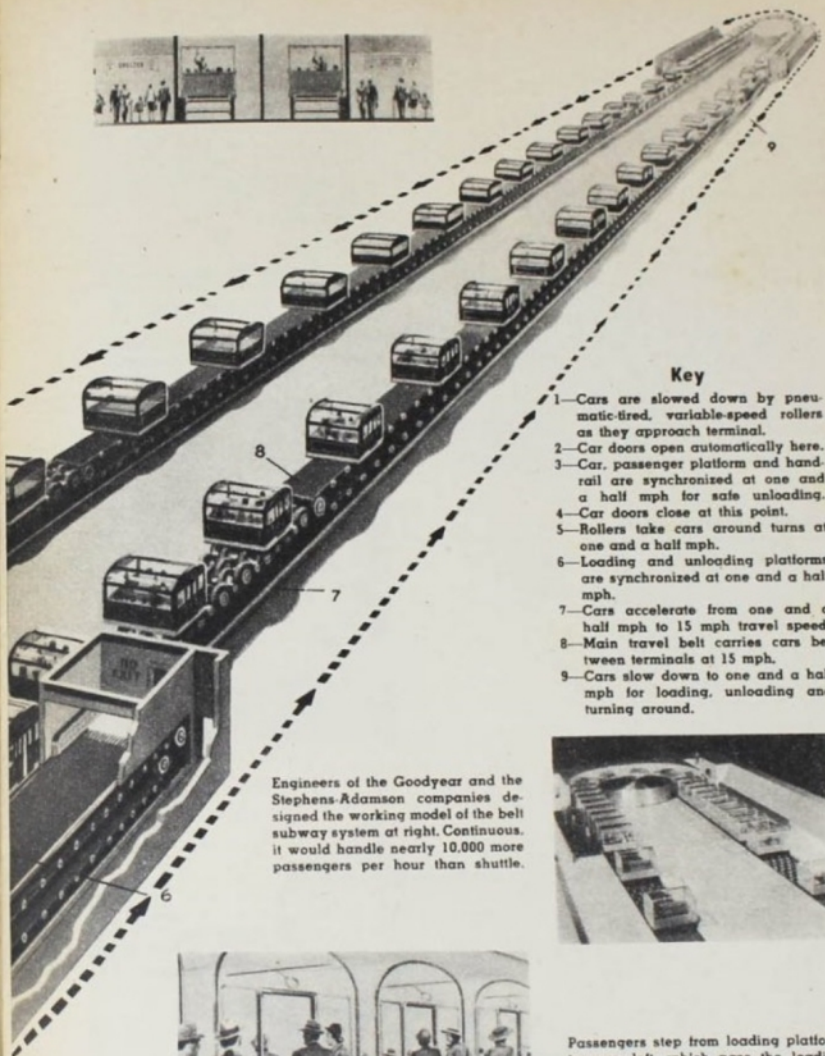
gers. A maximum of 16,000 passengers per hour can be carried in each direction.

The doors close automatically at the end of the passenger platform and our car passes from the loading belt to a 33-foot-long bank of pneumatic-tired accelerated wheels. They are power-driven and increase speed to 15 mph, spacing the cars several widths apart for the 1,800-foot distance between terminals. At the Times Square end a decelerating platform slows us down to one and a half mph and closes up the cars. We step off less than two minutes after leaving Grand Central.



20

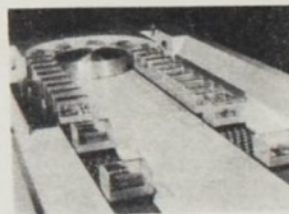
FRANK TINSLEY '53



Key

- 1-Cars are slowed down by pneumatic-tired, variable-speed rollers as they approach terminal.
- 2-Car doors open automatically here.
- 3-Car, passenger platform and hand-rail are synchronized at one and a half mph for safe unloading.
- 4-Car doors close at this point.
- 5-Rollers take cars around turns at one and a half mph.
- 6>Loading and unloading platforms are synchronized at one and a half mph.
- 7-Cars accelerate from one and a half mph to 15 mph travel speed.
- 8-Main travel belt carries cars between terminals at 15 mph.
- 9-Cars slow down to one and a half mph for loading, unloading and turning around.

Engineers of the Goodyear and the Stephens-Adamson companies designed the working model of the belt subway system at right. Continuous, it would handle nearly 10,000 more passengers per hour than shuttle.



Passengers step from loading platform to cars, left, which pass the loading point at the rate of 19 per minute. Operation and maintenance of new system are estimated at less than 50 per cent of the cost of the present subway.

21

MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

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**ESCAPE CHUTES CAN CUT
OUR AIRLINE DEATH TOLL!**

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ion



EJECTION of pod is triggered by crew member inside it. Bulkhead and door are airtight.

DECEMBER 22, 1959: Twenty-five passengers and six crew members on a Brazilian airliner are killed after their plane is rammed by an Air Force trainer over Rio de Janeiro. There is just one survivor—the military pilot.

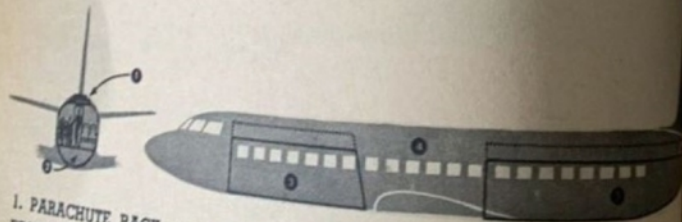
The story of the tragedy was familiar. Three times in as many years commercial planes carried all aboard to death after such mid-air collisions. In each case one person survived—the military flier who parachuted to safety from his crippled

ESCAPE PODS CAN PREVENT NEEDLESS AIR-CRASH DEATHS

By Robert G. Beason

plane after the crash comes. A box score for the four months shows: Airliners—77 killed. Military planes—4 saved.

In 1959 we recorded the worst airline safety record in history. More accidents and more fatalities than ever before. Today the horror of mid-air collision, no longer a freak, is a major danger to the air traveler from hotshot jet pilot to the tired salesman returning



1. PARACHUTE RACK atop pod. 2. Belly compartment holds freight, ballast and pneumatic shock absorbers. 3. Forward pod. 4. Galley, washroom, luggage. 5. Aft pod.



RESCUERS will be aided in their search for survivors by parachutes' vivid color.

Mid-air accidents are one of the few types which should offer some chance of escape. But the odds after a collision favor the military flier. He has a parachute. Airline passengers and crewmen do not.

Why can't airline passengers have a second chance, too?

Aboard ocean liners we find lifeboats. On military planes the use of parachutes is nearly universal. Yet aboard commercial [Continued on page 166]



AT SEA the pod makes an enclosed lifeboat. One of the chutes will serve as a sea anchor.

HOW POISONED AIR IS SHORTENING YOUR LIFE

MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

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APRIL

AMAZING NEW
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Illustrated

1959

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SIR VIVAL is a two-section car designed for safe highway use.

LAST WORD IN SAFETY CARS?

SIR VIVAL is the name of a new and startlingly unorthodox two-section vehicle designed to protect its driver and three passengers from death or injury on the highway. The prototype on these pages is the ten-year-old idea conceived by Walter C. Jerome of Worcester, Mass., who finally decided to build and produce his unusual car.

Jerome calls his creation, "The car that puts safety first." The cab section of the articulated vehicle houses the engine—in this case a 1956 Hudson

mill—two headlights that turn with the car, and the front wheels.

The cab is coupled to the main body of the car which houses an elevated, glass-enclosed cockpit which gives the driver, with the aid of mirrors, a full-circle range of vision; a third Cyclops-like headlight which shines straight ahead when the car turns; a spacious, comfortable "club room" for the three passengers; and trunk and baggage space.

A triple-section, air-filled bumper

STYLES IN ROTORS



The new Firestone job (above) carries two, has tail torque rotor. Kellett is more powerful; dual rotors intermesh.



Complete visibility is provided by the Firestone's large plastic nose. Occupants sit behind each other tandem fashion.



Copter is exceptionally stable; front wheel of the tricycle gear is steerable.

Kellett looks cumbersome but is very maneuverable and carries heavy payload.

Photos by Rudy Arnold

TWO new helicopters which will soon be gracing the airways in their civilian attire are the Firestone and the Kellett. The former is a snappy little two-seater like the Sikorski with a vertical tail rotor to counteract torque. Rotor diameter is 28 ft., high speed tops 100 mph., and rate of climb is better than 1,000 ft. per min. Engine is 135 hp. The Kellett has no tail rotor, but two top counter-rotating props. It is about 5 ft. shorter than the Firestone, but can carry more load. Engine is 245 hp.



SCIENCE and MECHANICS

The Magazine That Shows You How

Train of the Future



The industrial designer uses war's materials and methods to refine civilian goods. This is Lucille Guild's conception of a streamlined train for the future which uses molded plastic, such as is found in bombing plane's noses, and aluminum, another material vital to the manufacture of war goods.

It Won't Be Long Now!

The war goes on but brings us ever closer to an amazing new future.

By JOHN SILENCE

TOMORROW, Americans thought a few weeks ago, was that day just around the corner when they would get their first glimpse of the wonderful things in the bright new world of the postwar era. Industrially and mechanically, it was set out neatly in white lines on blueprint paper. The war in Europe was ahead of schedule, and we started turning hands to the task hearts had been set upon—the pleasant chore of bringing out for civilian use new products that war's emergencies had kept under wraps and others that war's technology had created or improved. It looked like the early dawn of a new day.

But it proved to be a false dawn, just as this magazine warned last fall it might be. Now tomorrow appears to be much farther away; the day that once was dawning is filed away for an indefinite future, and blueprints for the bright new world are being changed. Our postwar planners are still in battle dress. American ingenuity, which had hoped to switch from machines and methods of death and destruction to new comforts of peacetime civilian life is still on war's proving grounds. The war is moving us faster than ever our peacetime progress did, and now we make rockets to answer our old enemy's robot bombs, and rocket ships to smash Oriental shore defenses, and new medical and



This is the cross section of a train planned for postwar commuters. Using construction methods improved in wartime, the car makes the most efficient use of space. (Polhemus-Standard photo)

JUNE, 1945

63

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OCTOBER 1945
SCIENCE AND MECHANICS
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SCIENCE and MECHANICS

The Magazine That Shows You How

TOMORROW'S
ARTILLERY
Will Any City
Be Safe?



state of each government, but in the main, they are variations of cordite, a mixture of gunpowder and nitroglycerin, modified with starch, paraffin or some other stabilizing or "bery" ingredient.

Rockets—mankind's oldest gunpowder missile—came back into warfare because they have several basic advantages over the artillery shell or the airplane bomb. They have a well several

under the wings so smoothly that the pilot can feel not the slightest jar or rattle.

Of still other importance in plane warfare is the rocket's second basic advantage—the light launching apparatus. A rocket gun can stand up under battle conditions, such as over rough roads. In the air this means planes can carry and launch rockets far more than any shells they could shoot, and ground rocket launching mechanisms are extremely mobile and flexible and can be close to the front lines.

A third advantage is the acceleration which is characteristic of a rocket. As the shell leaves the muzzle, it gains speed and slows down as it nears the target. A rocket, however, is launched

at low or medium velocity, although high velocity is easily possible with modern fuels.

The ordinary war rocket starts slowly from its launcher, as compared with an artillery shell. Since a slow moving object is more easily deviated from its desired line of flight than a fast moving one, and since a slight deviation at the start is magnified throughout the flight, the rocket is not as accurate as might be desired. Furthermore, the rocket carries its own fuel

two types of flight influence its course and make computation of rocket facilities extraordinarily difficult. Finally, the problem of making the charge burn uniformly in powder rockets has not

GERMAN V-2 ROCKET BOMB

Approximate weight at start: over 12 tons
Approximate length: 57 feet
Approximate diameter: 5 feet

LEGEND

1. War head with approximately 1 ton of high explosive
2. Wireless compartment for remote control of flight
3. Fuel tanks containing between 2 and 3 tons of alcohol and liquid oxygen
4. Compressed air bottles, etc.
5. Recoil motors
6. Perforated tanks
7. Turbines driving pumps
8. Liquid oxygen pump
9. Distributor boxes
10. Jet directional-control pipes
11. Outlet
12. Carbon control surface in jet stream
13. Perforated tank
14. Alcohol pump
15. Pipes to fire
16. Main fire
17. Combustion chamber
18. Venturi

serious disadvantages or unsolved problems. When the propellant charge is ignited in a gun barrel, enormous gas pressure is set up against the sides of the barrel, the breech and the shell. The side pressures cancel, and the pressure forward is relieved by ejection of the shell, but the unrelieved back pressure causes the gun to recoil or kick. In this respect, the gun is the exact opposite of the rocket, which exerts its unrelieved pressure forward. Since it is absorbed in propelling the rocket, there is no recoil when a rocket is fired from a tube.

This is the rocket's first advantage over a gun. It has been taken advantage of in arming airplanes, where recoil of a fairly heavy gun mounted on the plane might check its flight, throw the plane off course and could even damage the frame of the craft. But 4-inch, and even larger, rockets can be launched from light tubes

tively slowly, then attains top speed in flight.

The ability to add its own energy to that of gravity is a major advantage which the rocket has over the air plane bomb. Not only does the former strike with greater force, but it can be aimed with far greater accuracy. Planes equipped for launching rockets have been in action on almost every battle and have been especially useful in probing and supporting amphibious operations. In addition, that plane rockets have and do destroy and damaged larger war vessels. Submarines are especially vulnerable to rocket attacks.

As corollary to these fundamental advantages are several others. Rockets can be launched in sizes almost impossible for guns. Indeed, there is no theoretical limit to the size. Large launching tubes can be easily built, but barrels above a certain size are costly and perishable.

But every weapon has its weakness. Rockets have several major disadvantages. They are less accurate and have shorter range than modern artillery. Most rockets are



left, an artist's conception shows the launching device located below ground and concealing on the side of a hill. Right, the rocket plane does a wing-over when its fuel runs out, describes a loop, and glides to earth to explode on impact.

been entirely solved. As a result, the power thrust is not precisely alike in any two rockets.

The rocket, however, has been amazingly improved, and rocketeers in today's armies boast of the feats they can accomplish with them. Furthermore, both inaccuracy and lack of range can be compensated for by bringing the launching apparatus close to the front lines, where it would be unsafe to use artillery of comparable

As this burns, the center of gravity of the rocket shifts, causing it to become nose heavy. As an additional complication, part of the rocket's flight is under power, as the fuel burns. Then the fuel is exhausted, and it becomes a gliding or free flying body, acting under the influence of a different set of physical laws. Both the shifting center of gravity and the

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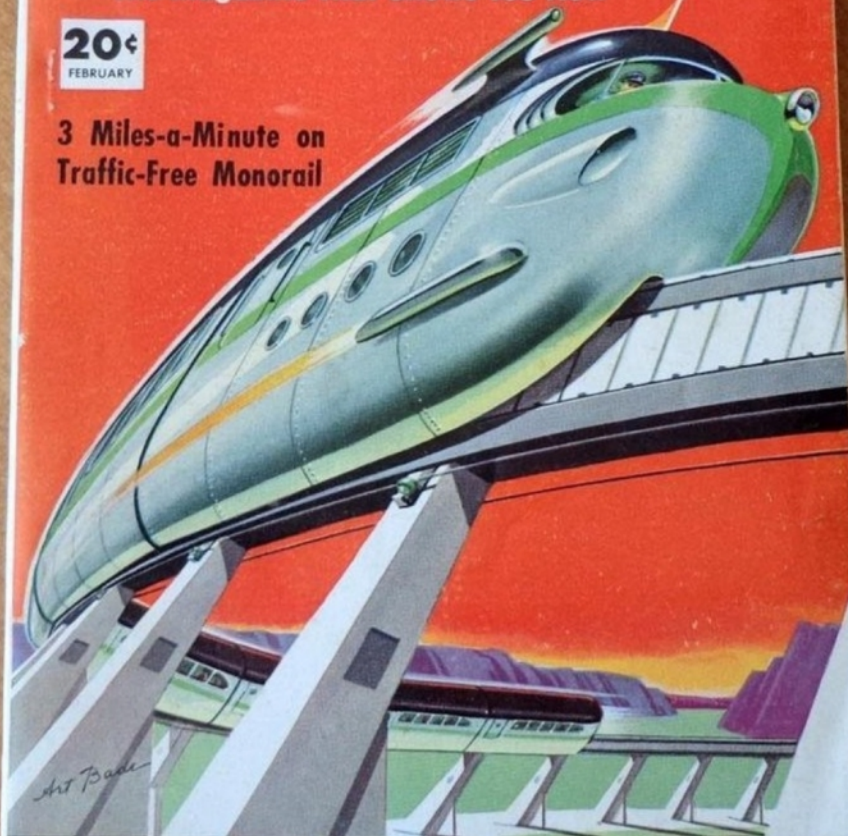
SCIENCE and MECHANICS

The Magazine That Shows You How

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FEBRUARY

3 Miles-a-Minute on
Traffic-Free Monorail



What to Do When
Your Furnace Quits

How to Revive Old
TV Picture Tubes

SCIENCE and
MECHANICS



3 Miles-a-Minute on Traffic-Free Monorail

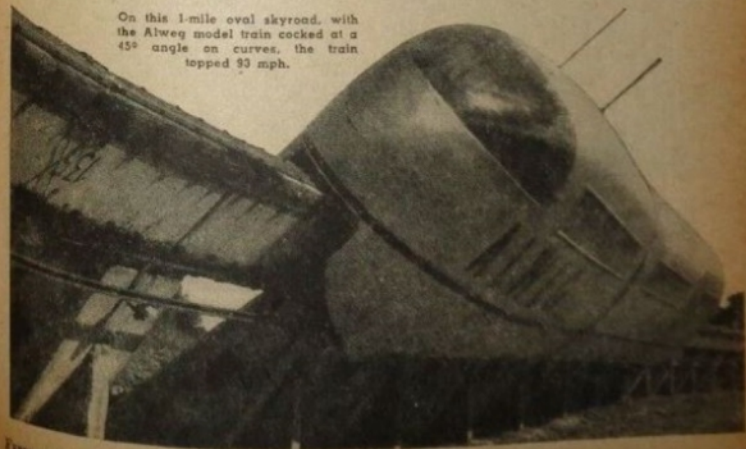
By DON DINWIDDIE

THERE may be time for that extra cup of coffee before you leave for work, if you travel on the new Alweg monorail. Actually, the full scale Alweg train has yet to be built, but as the accompanying pictures show, the $\frac{2}{3}$ scale model has already been tested on a 1-mile

oval track that held its speed down to slightly faster than the 90 mph speed limit for which the track was designed. Engineers estimate the full-scale train, operating on the straightaway, will reach 156 to 200 mph, or considerably better than 3 miles a minute. An

"all-wheel" drive effect will make it possible for this train to accelerate at a rate of 4.6 feet per second, which its backers claim is twice the rate modern conventional electric locomotives can achieve. And the same qualities of very high traction and all wheel power trans-

On this 1-mile oval skyroad, with the Alweg model train cocked at a 45° angle on curves, the train topped 90 mph.



FEBRUARY, 1953

67

Science & Mechanics

JUNE 35c

NEW MYSTERIES OF THE WANAQUE UFO REVEALED!

ARE THESE CARS OR TRUCKS?



JOE GUTTS REPORTS ON A WILD NEW UNEXPOSED WORLD IN DETROIT!



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Ford's Ranger II is a way-out show truck with wild ideas that will probably be seen on some future models. The expanding cab is one of these. Below is the two-seat version. Flick a switch on the master control panel and the rear portion of the cab moves 18 inches into the bed of the truck, a roof section comes into position and two additional bucket seats are dropped in place. Note the rear quarter windows of the expanded version at left. Aircraft-type canopy doors operate hydraulically.



The workhorse dresses up in style with all kinds of goodie options



Supersonic Bail-Out

NAVY's latest device is a special seat capsule enabling pilots of supersonic planes to parachute to safety. In an emergency, the pilot puts his feet into special foot rests and pulls a pre-ejection [Continued on page 169]



In demonstration of a cutaway mockup, model pulls strap to close doors and fire catapult.



Paint Your House Like a Pro

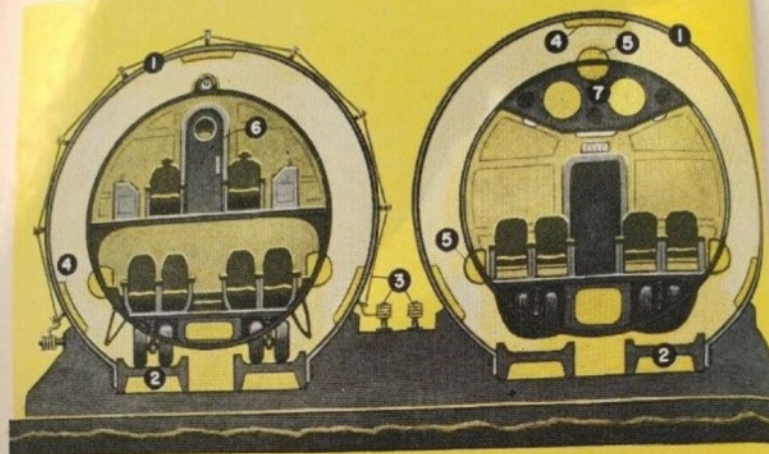
SCIENCE and MECHANICS

JUNE 1959

600-MPH MAGNETIC PASSENGER MISSILE



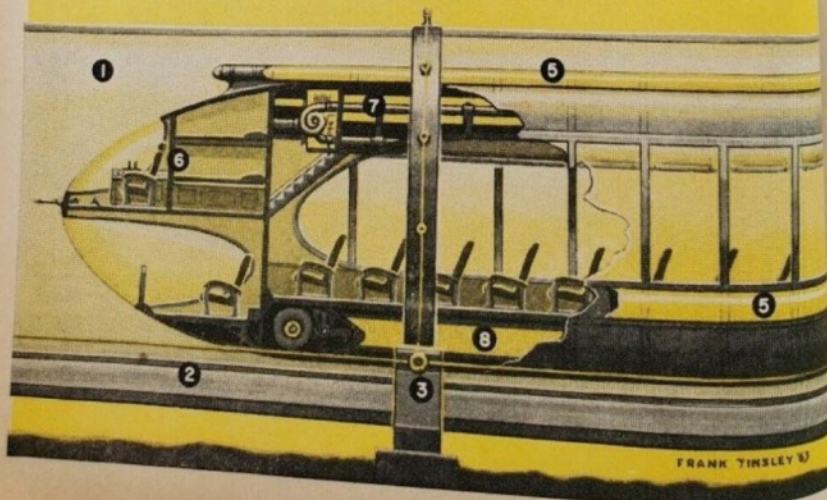
Historic Clocks of the White House



Explanation of Functional Details

Cutaway views of S&M's version of the magnetic train. Drawing above shows the vehicle in its enclosing tube, suspended between the three magnetized pads of a propulsion ring. At left is the nose cone with pilot's cab above and an observation bay below. The "landing wheels" lower to concrete tracks as the train slows down for a station. Right view shows elevated passenger section with wheels retracted for high-speed "flight." Side view, below, shows leading car passing through one propulsion ring.

1. Glass tube enclosure, open at bottom to vent air pressure developed by the train's passage.
2. Concrete tracks connect the magnetic rings and serve as an emergency "landing" runway.
3. Electrical feed lines at each magnetic ring.
4. Electro-magnetic pads propel the trains and also position them in center of the glass tubes.
5. Reaction cylinders keep train on a level keel.
6. Pilot's cab and crew's sleeping quarters.
7. Air-conditioning ducts and overhead lights.
8. Water, fuel tanks for auxiliary power unit.

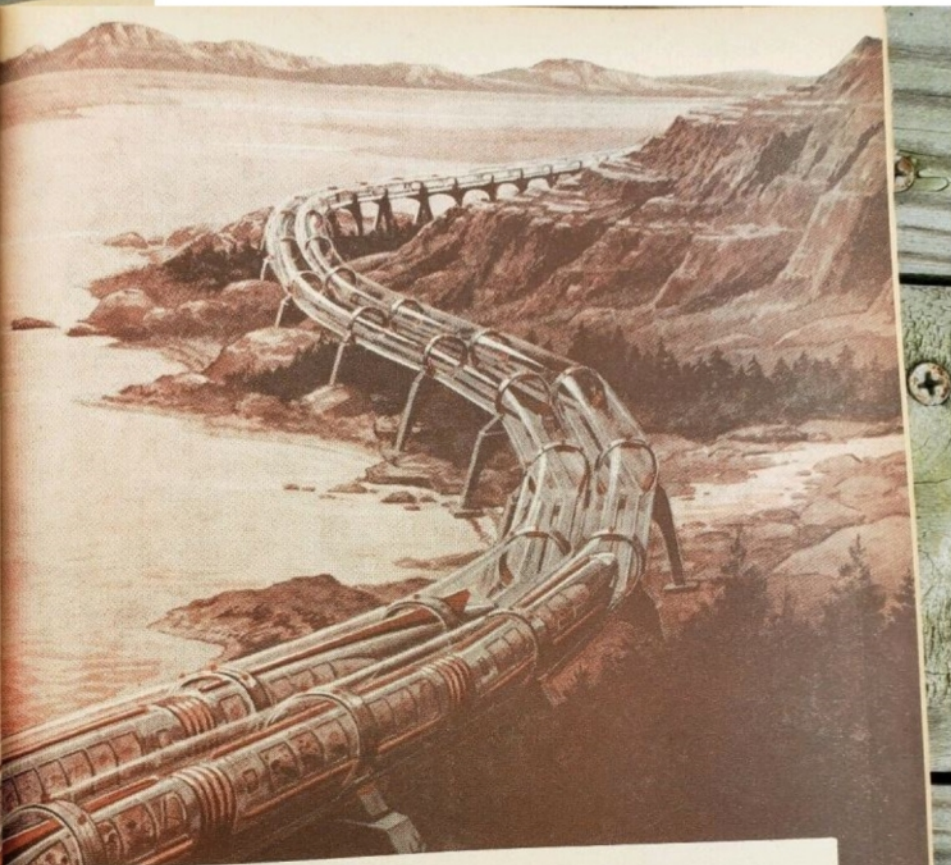
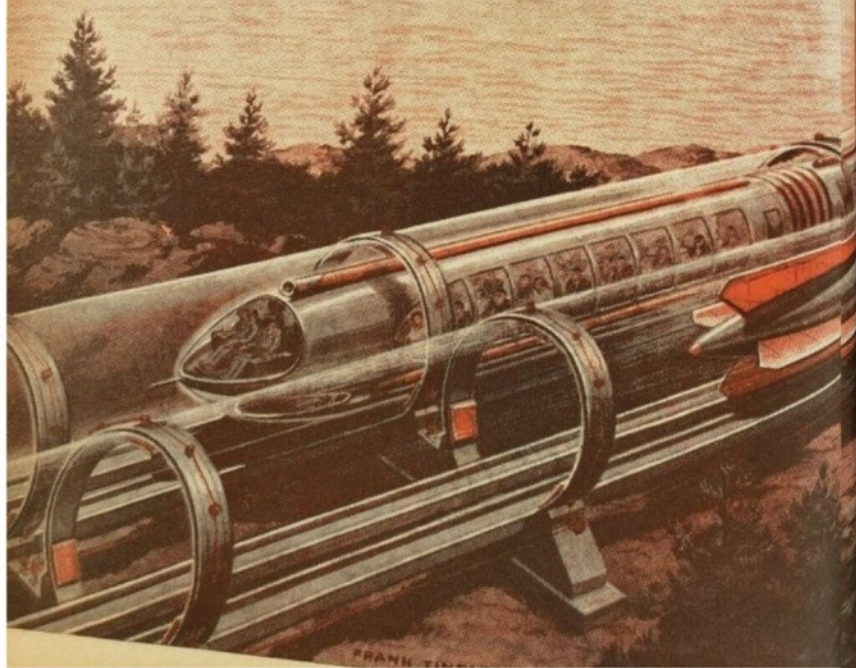


FRANK TINSLEY

600-mph Magnetic Passenger Missile

Frictionless mass-transportation vehicles may provide an answer to our exploding population problem that is now bogging down our express highways

Illustrated
By FRANK TINSLEY



By HANS KUTSCHBACH

AMERICA'S postwar population explosion, plus an ever growing trend toward suburban living, poses new and acute problems in human movement. To these, as evidenced in sprawling centers like Los Angeles, neither the private car nor autobus holds the answer. Despite the billions being invested in straighter, wider and faster expressways, the ever increasing volume of car borne commuter traffic is rapidly outrunning road space and, in a few years, will choke itself to a tangle standstill.

The only possible answer lies in a return to mass transportation—the rapid shuttle of short-haul passengers between home and job—along comparatively narrow rights-of-way and in some new and more efficient form of vehicle. I say “new” because each day it becomes more obvious that even the dressed-up versions of the old fashioned railroad are obsolete and uneconomical. For

JUNE 1973

Science & Mechanics

Read it first in S&M

HOW TO BUY A GOOD
USED PLANE
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from AutoFacts

CHEVELLE VS. TORINO

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GARY GABELICH TELLS
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AT BONNEVILLE"

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GARY GABELICH TELLS: "How I Plan to Break the

If some clever promoter ever holds a decathlon of motor racing events, Gary Gabelich well may be the man to beat. In his 13 years of racing, 32-year-old Gabelich has participated in nearly every form of organized racing from motorcycles to drag boats. Gary got his start in the late '50s, winning a trophy with the family Pontiac at a local drag strip in Pomona, California. A Cadillac-powered Crosley provided his first contact with pure racing machinery and from that point on he quickly became one of the most successful drivers in drag racing. Gary was the first ever to break into the seven second bracket for a quarter mile. Years prior to his 622

mph World Record run at Bonneville, Gary drove a jet car at 356 mph on the same course.

Along the way, the versatile Mr. Gabelich found time to participate in the astronaut program, serving as a test subject for zero G environmental control, centrifuge and sky diving experiments.

Early last year, while driving an experimental four-wheel-drive AA fuel funny car at Orange County Raceway in California, Gabelich slammed into the wall, breaking his left leg and nearly severing his left hand. Miraculously, the hand was sewn back into place with almost no ill effects and the multiple leg breaks are healing well.

Despite his injuries, Gary is confident he will be the first to drive a rocket car through the speed of sound. He already has more experience over 500 mph than any other driver in the world.

"28 seconds is not a very good time for 0 to 60, but not bad at all for 0 to 750!"

Sound Barrier at Bonneville"

Gary's new rocket car will be similar to his old one, only bigger. At 750 mph it will develop 100,000 hpi



When the all clear finally came, we had only eight minutes to complete the two-way run. The crosswinds had died down, and we were ready. As I'd done many times before, I started the countdown at ten seconds.

"Ten." Through the small, narrow windshield, I saw a vast wasteland of stark, white salt stretched out flat and unearthly on all sides to barren rock mountains, spiking the horizon with jagged, vertical slivers of stone.

"Nine." Directly in front of the car, a narrow, sporadic, jet-black centerline punctuated the 80-foot course, tracking seven miles into the distance.

"Eight." The *Blue Flame* pulsed with power like some giant horizontal moonshot granted temporary life. She hissed and whistled at me as I watched pressures stabilize in the rocket fuel tanks.

"Seven." Somewhere behind me, a pickup truck bumped against the *Flame* and began to push the record car forward.

"Six." As we moved slowly ahead, I double-checked the three sets of safety harnesses securing my body to the narrow cockpit of the car.

"Five." Beneath and around me, a 14,000 pound thrust rocket engine waited not too patiently for its brief 22 second appointment with the record book. We'd done it once. Could we do it again?

"Four." In the earphones, I could hear my breath coming faster through the oxygen-mask-mounted microphone.

"Three." The slight surge of acceleration was gone now as the pickup veered away from the *Blue Flame's* tailpipe.

"Two." My right foot, poised above the gas pedal.

THRUSTING IT TO THEM

Cold Thrust Augmentation technique prompts new designs in vertical- and short-takeoff-and-landing aircraft

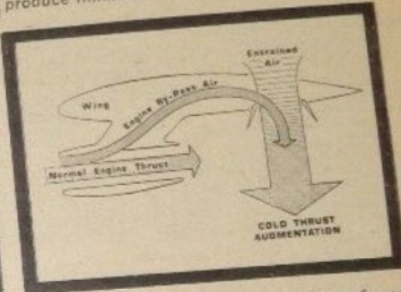
A new look in aircraft is appearing on drawing boards at Bell Aerospace. The designs are based on a recent breakthrough in thrust augmentation that enables design engineers to obtain the added thrust needed for jet-powered vertical or very short takeoffs and landings.

The technique, known as Cold Thrust Augmentation (CTA), calls for engine

fan air to be routed to an aircraft's wings where it is discharged downward through special nozzles for increased thrust and lift, allowing the aircraft to rise vertically or make abbreviated takeoffs and landings. Once airborne, the fan air is returned to the engine nozzles for conventional forward flight.

The principles of CTA have been under investigation for some time. Only

Crew air rescue aircraft (far left) has slotted wings and nose for downward and rearward thrust using the Cold Thrust Augmentation (CTA) system. At left, two-way wing design using CTA. In vertical or short takeoff mode, the wing and nose slots open to allow some of the engines' turbofan air to be ducted into them for downward and/or rearward thrust (below). For every pound of air forced through the nozzle, seven pounds of ambient air above the wing are sucked along, greatly increasing lift. In flight, the system closes to produce minimum drag.



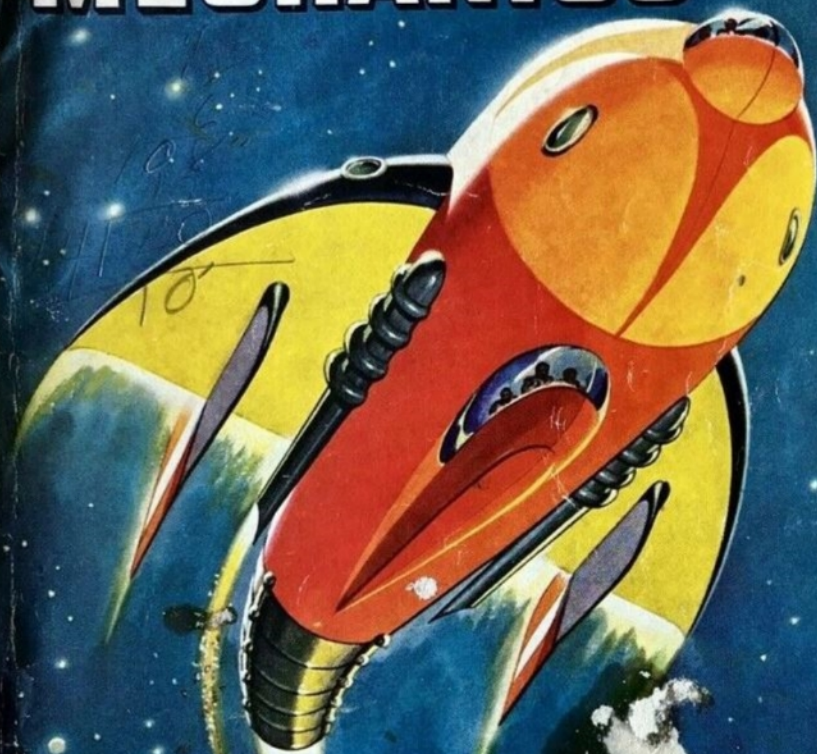
recently, however, has the degree of augmentation obtained in tests been great enough to show real potential for use in operational aircraft. The problem has been one of devising a system that is not only efficient, but practical and compact enough to meet aircraft weight and size limitations.

The breakthrough was announced in early 1972 when Dr. Hans von Ohain, chief scientist of the Aerospace Research Laboratory, Wright-Patterson Air Force Base, Ohio, reported that the laboratory had achieved thrust augmentation ratios of up to 2-to-1 with an experimental augmentation device. More recently the Aerospace Research Laboratory achieved similar results on a large-scale Cold Thrust Augmentation wing model designed and built by Bell. Thrust augmentation ratios measure the degree to which engine fan thrust can be increased in vertical or low speed flight. Therefore, the laboratory results prove the ability to double the thrust output of an existing turbo-fan engine. The best previous thrust-to-weight ratio of earlier designs had been about 1.3-to-1.

Cold Thrust Augmentation is based on the aerodynamic principle that says: A stream of air will capture and drag along

164
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SCIENCE and MECHANICS



**The ROCKET PLANE is Here
Now What About Space Travel?**

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The Rocket Plane is Here
Now What About Space Travel?

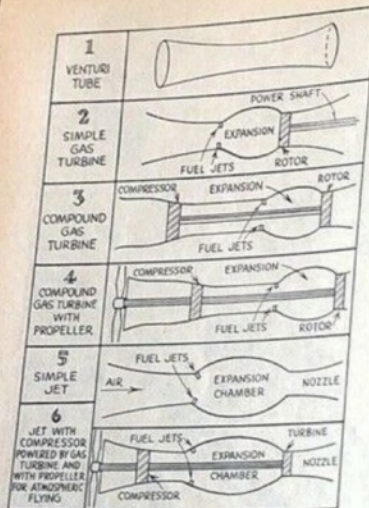
By MAURICE RODDY

WHILE there are still many problems, development of the rocket-driven space craft, long a dream of the pseudo-scientists, has been given a tremendous impetus by the new "jet" planes announced for military use. It won't be long, perhaps, before it will be, "Look out, Mars, here we come."

This may sound plenty Jules Verne, but for

years scientists of real note have been attempting to provide a means of reaching space. Much time and thought have also been given to the navigation of space. Readily accepting sea and air navigation as routine, the average person regards space navigation, or astrogation, as a terrifically complicated problem. Just one look at a clear night sky and the question is, "How can anyone

JUNE, 1944



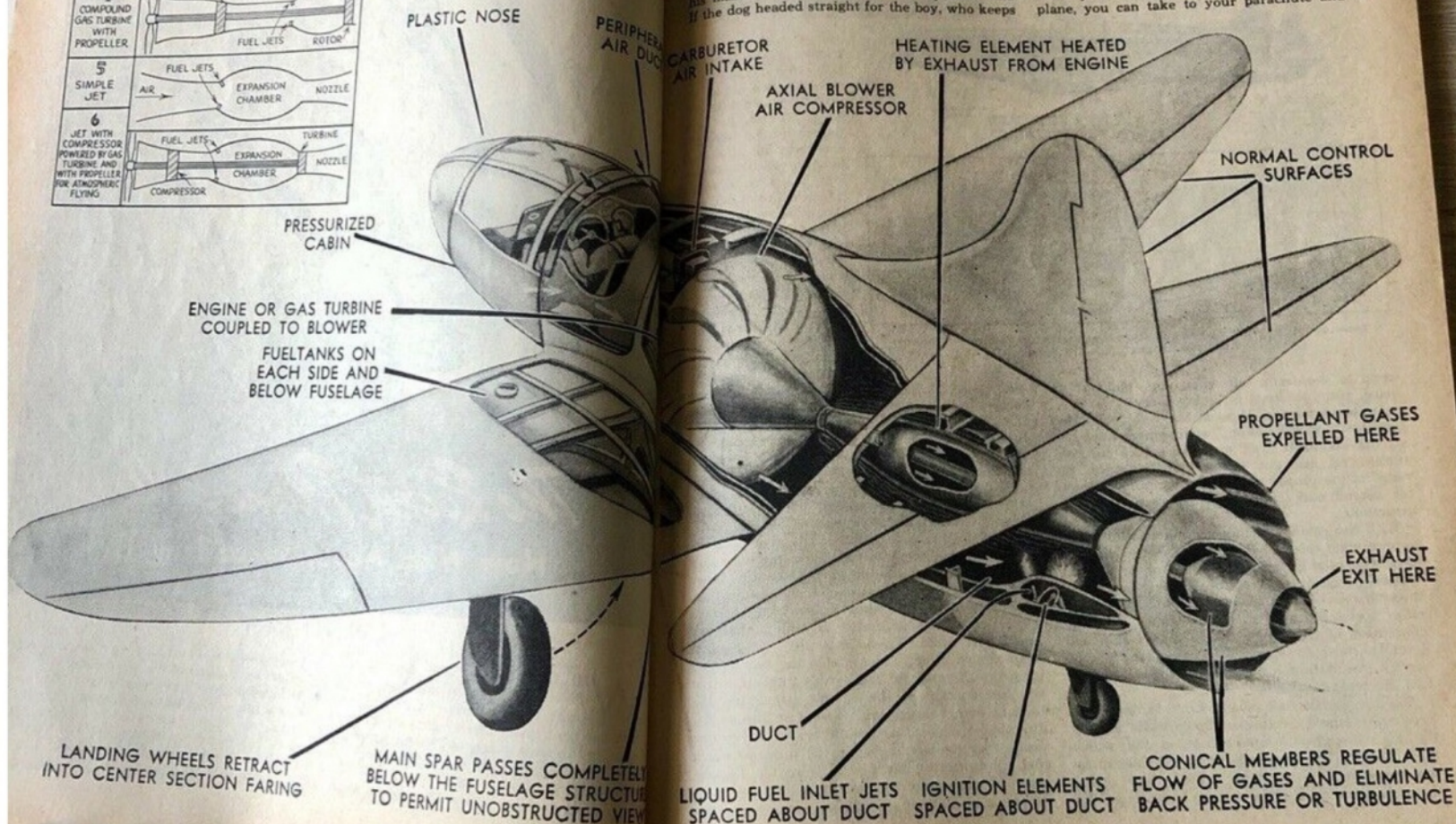
Now jet engines and gas turbines may have been developed, at left, and, below, a composite drawing of several European rocket planes.

ever find his way among all those... That is the \$64 question which Dr. P. Miller of General Electric's education department, Schenectady, N. Y., attempted to answer during a recent Science Forum broadcast from Station WGY. Pointing out that now was the time to argue the possibility of space travel, the first filling station to be opened on the moon, Dr. Miller stated that perfectly competent scientists can quote figures and formulas proving that it is possible even to

present fuels to go to the moon or Mars. However, the catch is that a moon-rocket would cost about the pre-war price of a giant battleship. Assuming for discussion that some experimenter has tapped an adequate source of atomic power which would materially reduce rocket costs, Dr. Miller charts a flight into space. According to our space-skipper, the old problem story of a boy and his dog applies to rockets in space. The boy is walking along along a country road, whistling to his pup, who is off in the fields chasing rabbits. The dog hears him, lets out a few answering yelps, jumps up and down a few times until he catches sight of his master, and sets out to catch up with him. If the dog headed straight for the boy, who keeps

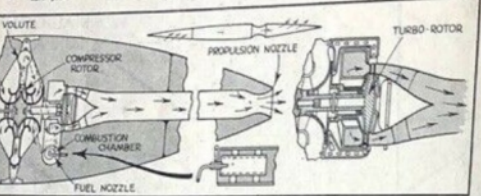
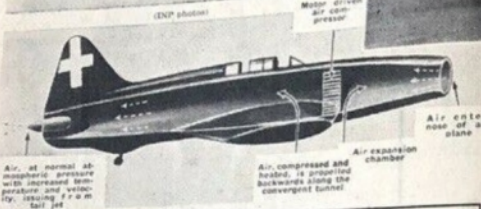
walking along the road, he would have to follow a curved path which takes him longer and farther. But the dog is smart, so he cuts across lots and intercepts his master somewhere along the road.

Rocket astrogators flying a practical course to Mars will do what the dog does and head for where the planet is going to be at the time its orbit is reached, for if you point your ship directly at Mars, you will find your target running away from you at a speed of around 900 miles a minute. Due to constant necessary turns and fuel consumption, this would be pretty expensive chasing plus an extremely hazardous operation. When you run out of fuel in a conventional type plane, you can take to your parachute and de-





Two views of a rocket plane and below, a schematic of its ascent. (Air Service photo.)



Drawings of the Whittle jet engine patents, announced as the basis of the new American designs. (From INP photo.)

scend to the earth, but when you "bail out" in space, you just keep on going forever.

As for contacting Mars at the right place and time by "dog navigation," astronomers have had all the details of that question solved for centuries and can put the planet "right on the nose" at the proper time. Fuel can also be saved for takeoff and landings by following their instructions.

With the earth whirling around the sun at an approximate speed of 18.5 miles a second, the fuel saving space-skipper will time his takeoff and direction precisely so that the rotating earth will throw his rocket into space with almost the maximum speed required to reach Mars. It is the intention of Dr. Miller that a rocket ship will actually coast to Mars after it is free of the earth's gravitational pull. In evidence of this, he cites:

"No energy, no fuel of any kind, is needed to keep the planets circling in their orbits around the sun. The gravitational attraction with which the sun drags them to it is exactly balanced by the centrifugal force with which their speed through space tries to hurl them away from the

into space, H. S. Richardson of the Mt. Wilson Observatory points out that while this would be the cheapest rocket route from earth to Mars it is expensive in time. After being hurled into space, the rocket-skipper would need but little additional fuel to hit the few additional miles a second that would swing his rocket into an elliptical orbit halfway around the sun to meet Mars 251 days and 338 million miles later.

Because there are an infinite number of orbits which a rocket ship may follow for interplanetary commerce, time can be saved by estimating space arrivals at the closest points planets are together. The earth-Mars flight could be made in 156 days by meeting Mars a quarter instead of halfway around its orbit. To do this, the rocket must head almost directly away from the sun instead of in the direction of the earth's motion so that the combination of the earth's speed and the rocket's own velocity will send it in the proper direction. While this would be a time-saving route, the trip would require 32 times as much fuel. By meeting Mars at a point ten degrees along its orbit from the starting point, the space flight can be made in only 88 days over a distance

of some 50 million miles. However, this would require a take off without benefit of the earth's free shove. It would cost 382 times more in fuel than the economical 180 degree course.

Now with the establishment of several earth-Mars routes, the next question calling for an answer is, "What happens in space if a rocket plane gets off its course?" This is a \$64.50 question which Mr. Richardson will answer.

"Space orientation," he says, "is a simpler job for the astronaut than locating one's position in the middle of the Pacific. Should the rocket captain find himself lost because the takeoff angle was not just right or he had to dodge a comet, all he has to do is to determine his distance and direction from the sun. An earth navigator is obliged to locate himself on the curved surface of a sphere, but navigating in space is like traveling on the flat surface of a phonograph record. The orbits of almost all the planets lie in or close to one plane with the sun at the center. To locate himself on this 'disc,' the astronaut need only measure his celestial longitude.

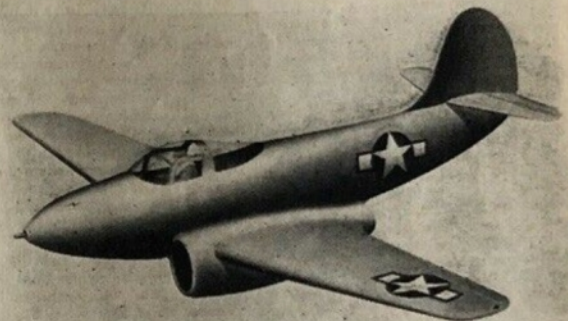
Taking his sextant to the window, he measures the angle between the sun and some bright fixed star like Regulus, which is close to the plane of the planets. His tables list the longitudes of more than 50 of these standard stars. By subtracting the measured angle from 180 degrees, the difference between his longitude and that of Regulus will be obtained, which is where you are." Simple, isn't it?

However, the space-skipper must still find out how far he is from the sun. This requires another "shot" at some convenient body within the solar system whose longitude and distance from the sun at all times is also given on the standard tables.

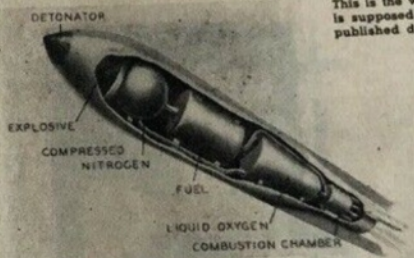
For example, let's pick Mars and get the angle between it and the sun just as we did with Regulus. We now have our longitude and three angles and one side of an astronomical triangle; the angle between the sun and Mars; the angle between the ship and Mars, which is the difference in their longitudes; and the third angle by subtraction; plus the distance of Mars from the sun. The second side of the triangle is the astronaut's own distance from the sun which can

be figured with a mechanical calculator designed for the job. Summarizing interplanetary space navigation, it appears that about all there is involved is: Two sights with a sextant, a little subtraction, and a book of standard tables. In addition, of course, the space-skipper must know his stars.

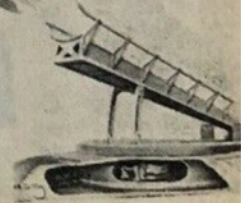
Granting that the interplanetary plane can be built and there are space airways, if we expect to successfully fly through the high upper atmosphere, we must know more about stratosphere weather than we do at present. Everyone knows that atmosphere for the first few miles above the earth is composed of large masses of moving air consisting of warm and moist combinations and dry and cool combinations traveling at fast and slow rates. When dissimilar masses meet, storms begin. It is the weatherman's job to analyze these movements which are vital to air safety. Right now most information concerning



This is the way the new jet plane is supposed to look, according to published descriptions. (Aviation photo.)



This is the long range Nazi rocket which the Germans threaten to use against England. They make wide claims for it. (Acme photo.)



POPULAR SCIENCE

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MECHANICS AND HANDICRAFT

November, 1950

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Crow Reports Studebaker V-8—p.100



**Pack Plane Drops
Complete Combat HQ**



ARMED
SCIENCE



Pack Plane Dr

This may be the most serious of...

By Robert C. Lundbeck

THE military has been looking for a way to pack a plane for a long time. The idea is to have a plane that can be packed in a container and then unpacked in the field. This is a very important concept for the military, especially in the context of the Vietnam War.

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Complete Combat HQ

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Light-Propelled Space Ship
See Page 64

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STRANGEST FOODS IN THE WORLD

Light-Propelled SPACE SHIP

Every star is a powerful atomic furnace. Now Science says we can use man-made stars to drive space ships.

By Frank Tinsley



THE first news flash went out over the Mars radio during the early evening. An unknown type of skyship, described as a "flying cup," had been sighted over the mountains that surround the Polar Cap. The vehicle was definitely not of Martian origin, the announcer went on to say. Further details were promised as soon as contact was established with eyewitnesses.

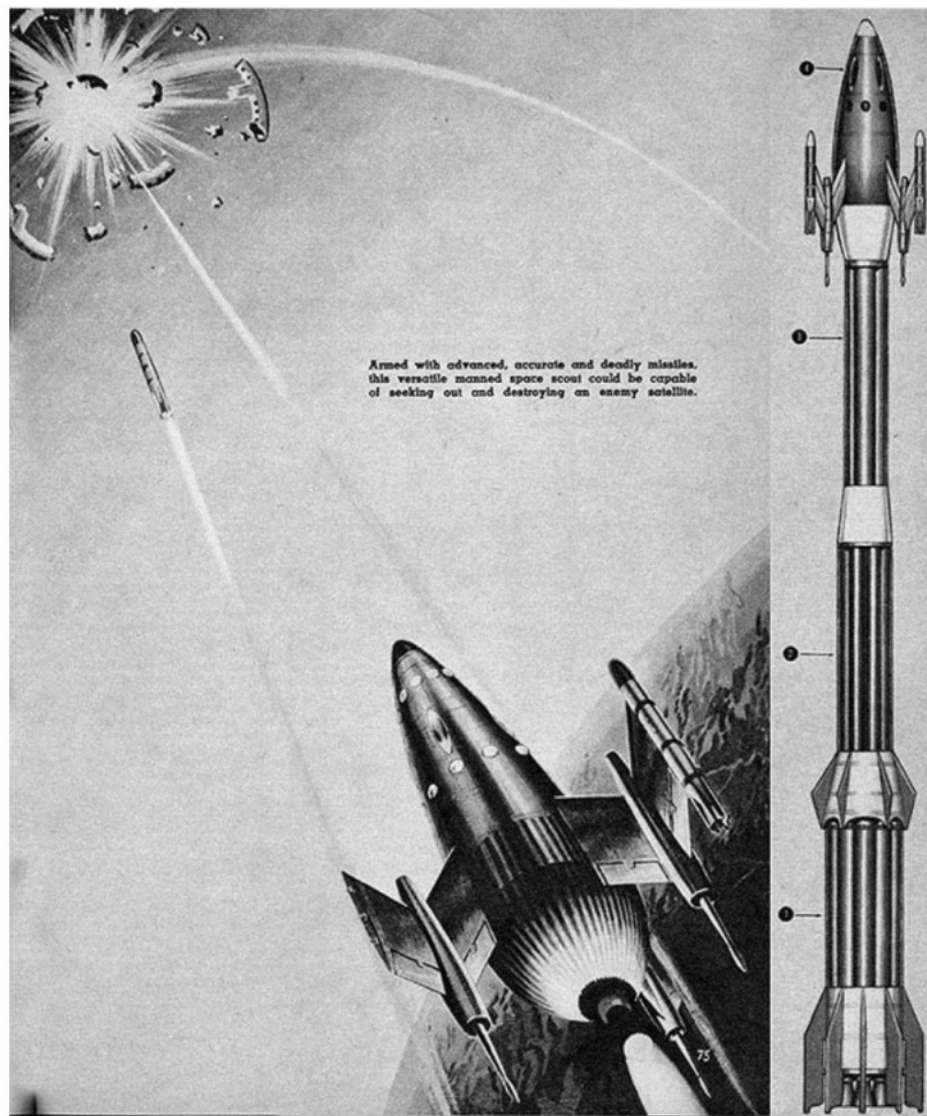
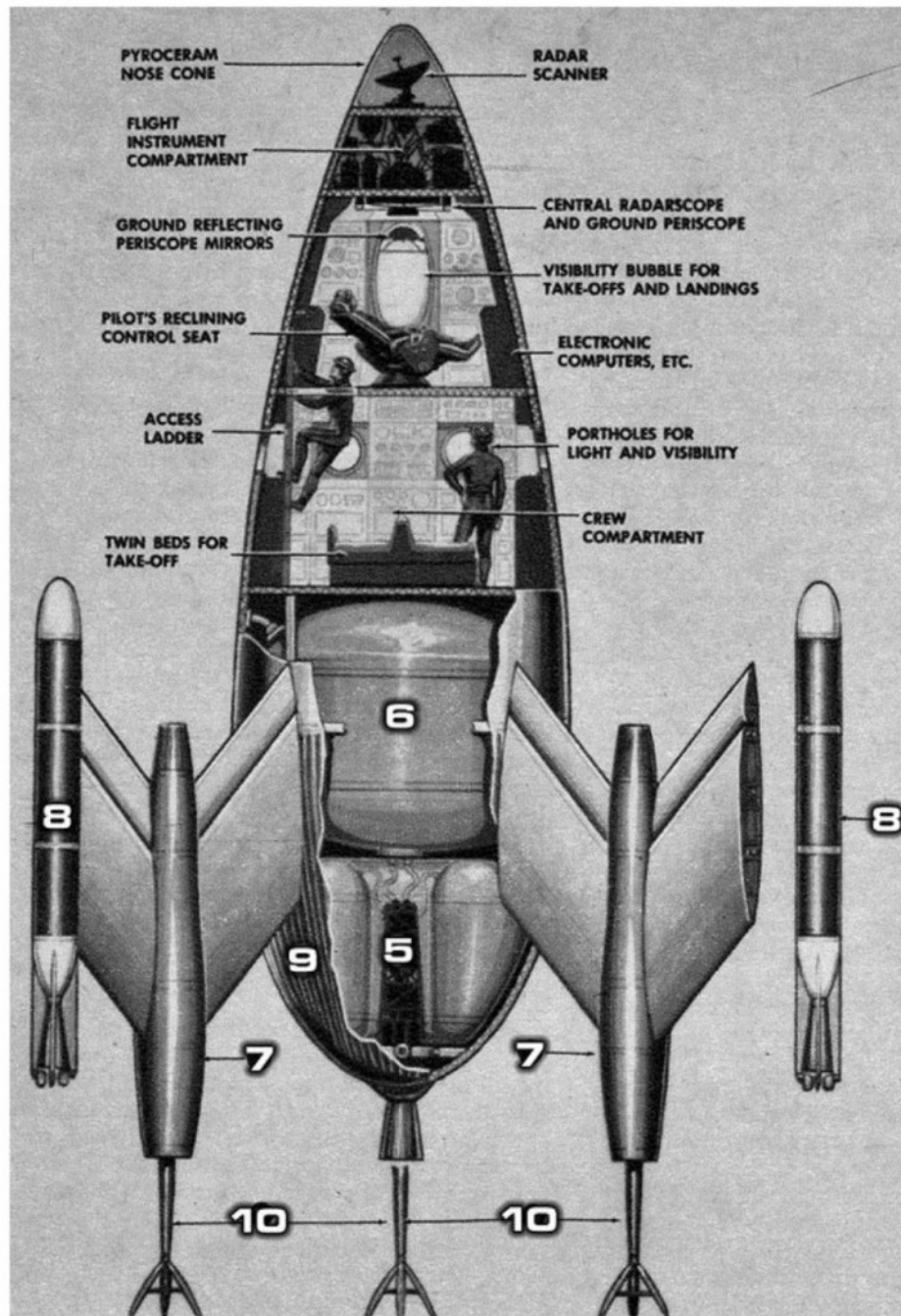
Less than an hour later, Martian families received a first-person report from one of the actual witnesses, a scientist well qualified to comment on such phenomena. He was a senior professor of the astronomical observatory.

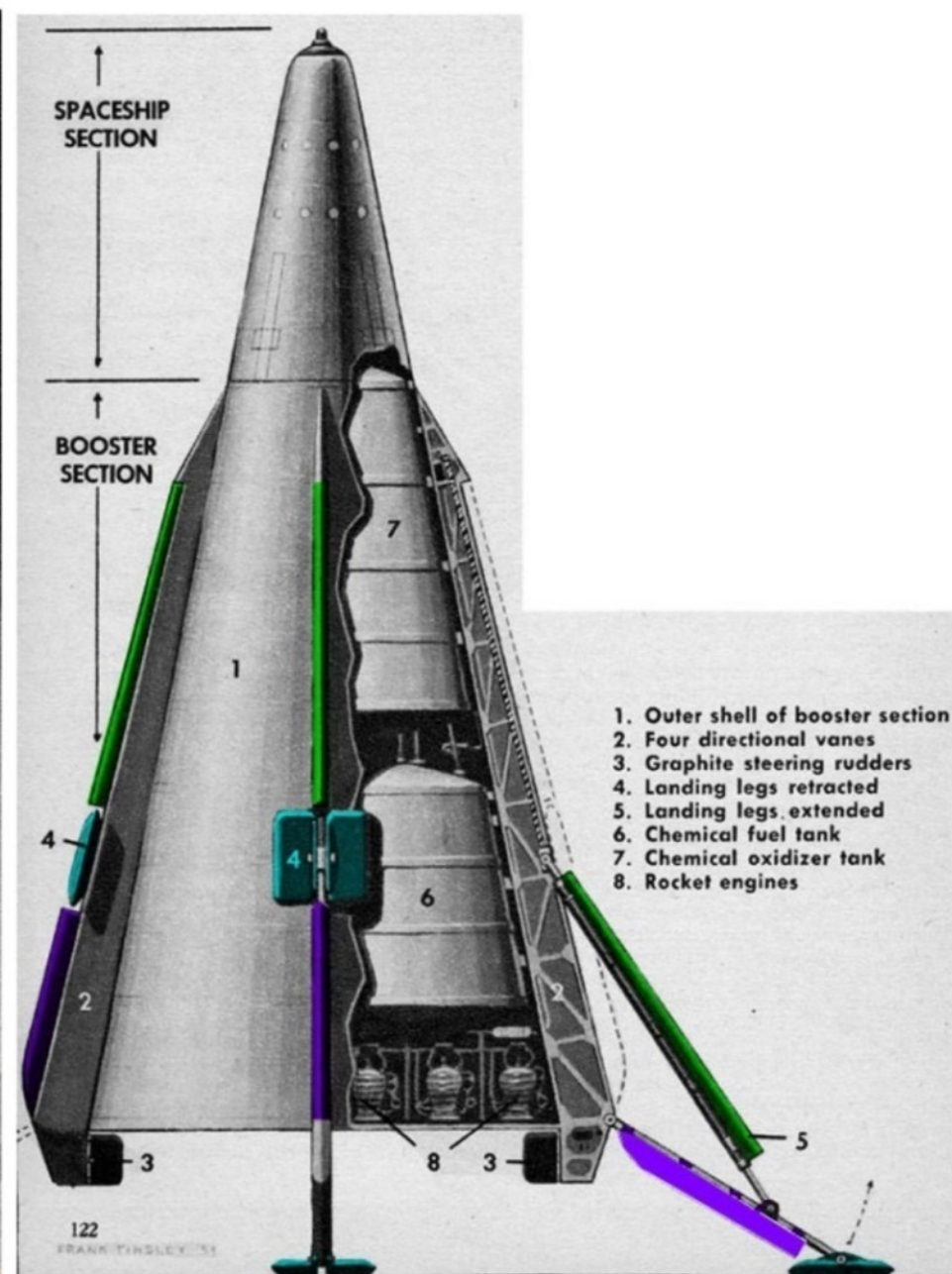
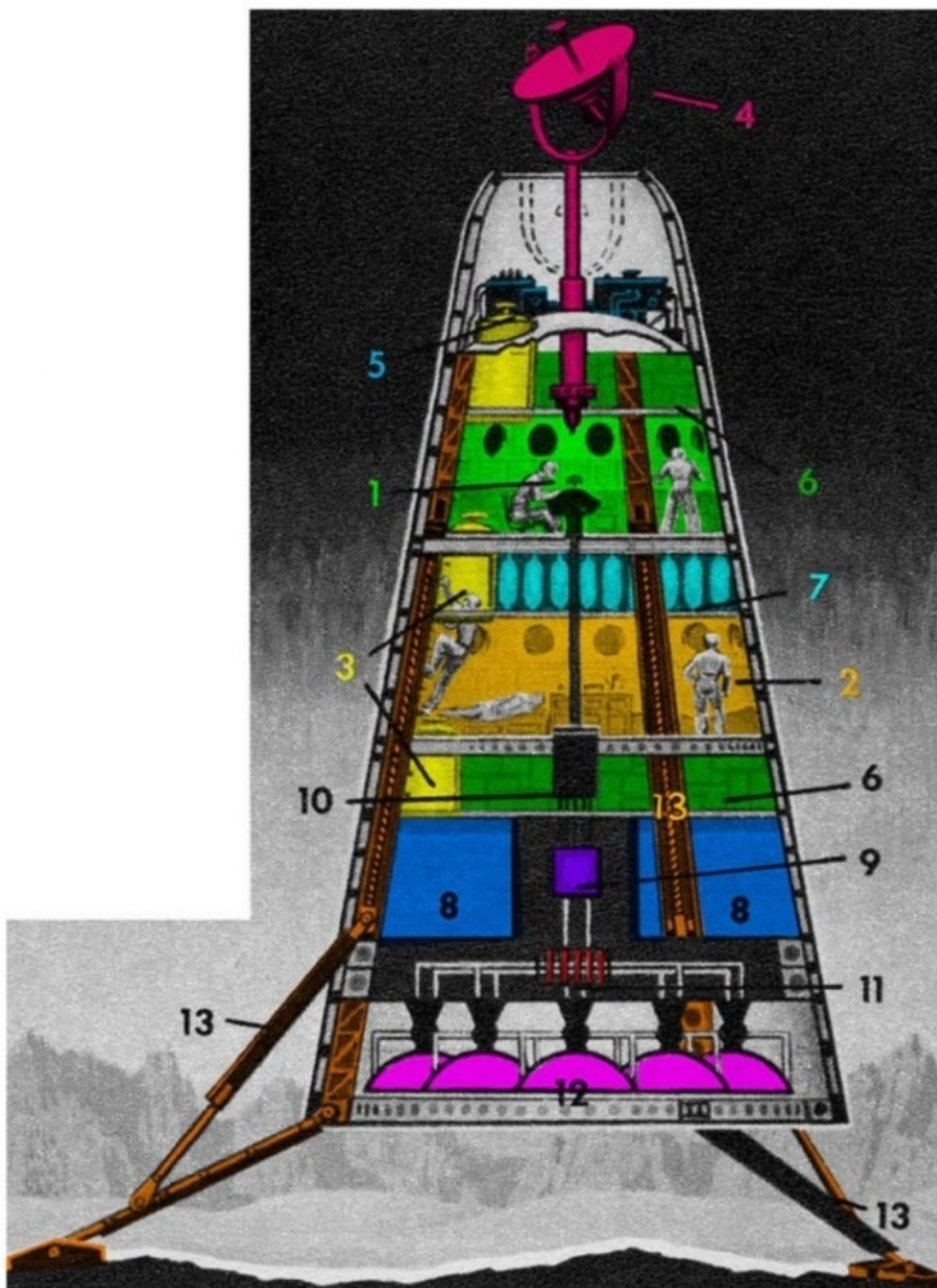
"I was leading a party of technicians on an inspection tour of our Polar observation stations," the Professor began. "We were gliding up the ramp to the station atop the mountain when I heard a sudden exclamation from the last member of our party. In the split-second it took

me to swing around, a dazzling, cup-shaped object had raced across the dark sky to a point almost directly overhead.

"It was then I realized that the light was emanating from a solid body of some kind. As we watched, the thing slowed down and gave us an opportunity to observe it through our glasses as it disappeared over the western hills. A few moments later, the light trail reappeared, rising in an abrupt curve to a great height. It hovered for a moment, then descended in a vertical beam until the intervening mountains cut off our view. The machine had evidently landed!

"We continued to the station and reported the incident. Then, using the station instruments, we located the landing site at a point on the other side of the Polar Cap. While awaiting the next development, our party came to an agreement on the physical description of what we had seen. The





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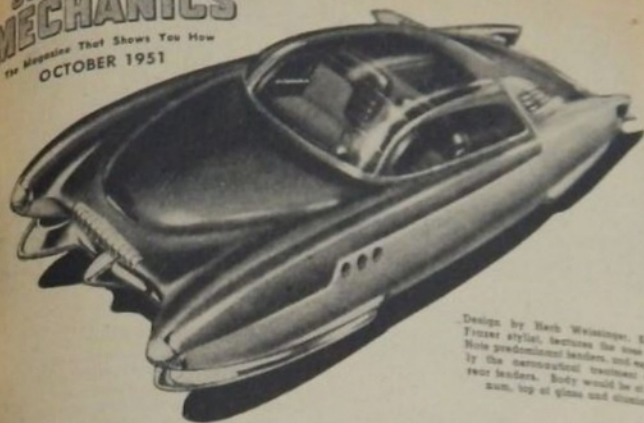
**Kaiser-Frazer
Plans Aluminum Car**

**Which Shotgun
Should You Use?**



**Make Your Home
Weatherproof**

SCIENCE and
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The Magazine That Shows You How
OCTOBER 1951



Design by Herb Weissinger, Kaiser-Frazer stylist, features the new doors. Note predominant fenders, and especially the aerodynamic treatment of the rear fenders. Body would be at least sun, top of glass and aluminum.

KAISER-FRAZER PLANS Aluminum-Glass Car

By DEAN A. HAMMOND
Vice President in Charge of Engineering,
Kaiser-Frazer Corporation

AS LONG as war clouds threaten the world, what tomorrow will bring for the automobile is anybody's guess. But when the Government's mobilization program is relaxed, many of us in the auto industry believe these developments will be evolved:

Lightweight cars with all-aluminum bodies, which will use glass extensively to provide the motorist with more visibility—in windows, windshields and even, to some degree, as compartment "bubbles."

More efficient engines, weighing half as much as today's, built of aluminum, titanium and magnesium alloys, with new combustion chamber designs aimed at reducing the amount of gasoline wasted through incomplete burning.

Improved springing that will give the lightweight car all the comfort once thought possible to achieve only in the heavy models.

Better interior design which will eliminate tunnels and "doghouses" now taking up so much floor space; more plastics and more safety devices to protect driver and passengers in the event of accidents; rear-compartment seat adjustments which can be moved and locked in

position (Fig. 2); doors controlled by push-button electric motors in the same manner that window glass is rolled up and down now.

Exterior design lines that go even further in the direction of functional styling than even modern cars. Examples of this trend in styling are the 1951 Kaiser models, which received the coveted Prix d'honneur this year at the French Riviera auto exhibition for their "anatomic" lines.

Herb Weissinger, Kaiser-Frazer chief stylist, shows in some of the illustrations accompanying this article and on the cover, some experimental car designs which disregard the traditional idea of acknowledging the nose of the vehicle. His theory is that the fenders of the future car may predominate in design (Fig. 1) to give an illusion of greater length and an airplane-cabin type passenger compartment. In Weissinger's lightweight car of the future, stout steel bumpers would give extra protection. There are many restrictions to using so much glass immediately, and, recognizing this, Weissinger suggests a power-controlled plastic canopy which could shut out the sun's rays when desired (Figs. 3 and 4).

OCTOBER, 1951



Fig. 1. Artist's conception of attack by Russian La-17 frontier fighters against a B-36 A-bomb carrier.

Can the Red Jets Stop the B-36?

By CHALMERS H. "SLICK" GOODLIN
International Editor, Aviation Age

IF AMERICA'S bombers were forced by world conditions to strike against Communist Russia, the first plane up to challenge our B-36s and B-47s would be the Red "frontier fighter," the La-17 (Figs. 1 and 2). This rakish rocket-and-jet-powered craft has been kept carefully under wraps by the MVD, and has appeared outside the USSR in only limited numbers. But it is known to be coming off the Soviet production lines in quantity second only to the MiG-15 fighter-interceptor. Tactically, it is probably considered by the Russians themselves to be a more

important airplane than the MiG-15, which they have assigned to the La-17's toughest, most important task: the mission the Soviets would attempt to carry out—stopping our atomic bomb carriers.

If Russia cannot stop our A-bombers, it is unlikely that she could win a World War III. Thus, no less a personage than the Generalissimo's own son, Lt. Gen. Vassily Stalin, has been entrusted with this mission of defending the USSR. As head of the PVO, Anti-Air Defense Command, he is in charge of not only frontier fighters in the radar network, antiaircraft artillery, and probably guided missiles. His pilots are considered the elite of the Red Air Force.

In Lavochkin's La-17, these PVO airmen may have the finest long-range jet fighter yet in service anywhere at this writing. It was developed from the German Ta-183 design to conform to certain obvious tactical requirements. To per-

form the vast frontiers of the USSR, the fighter has been designed with a generous combat radius. A supplementary rocket engine permits the La-17 to climb rapidly to high altitudes. Airborne radar gear makes it easier for this plane to locate, at high speeds and altitudes, any hostile bombers. Heavy firepower is carried in order to overcome the armoring and structural toughness of U. S. aircraft. All these characteristics, and others, are reported to exist in the La-17.

The La-17 frontier fighter is a single-seater, shoulder-wing monoplane, whose high location of the sweptback wing distinguishes it mainly from the more familiar MiG-15 fighter-interceptor active in Korea. The La-17's wing is swept back at approximately 38° and has a relatively thin airfoil section. The fuselage and cockpit and raked tail assembly are all reminiscent of the MiG's. But the La-17 is a somewhat larger, heavier aircraft with an overall length and wingspan of about 36 ft. and a gross weight of some 16,000

pounds. With normal power, it is slightly slower than the Korean MiG at a reported 650 mph. The frontier fighter may, however, approach or possibly exceed the 700-mph mark with both turbojet and rocket plants operative.

This Red defender is powered by the Russian-copied, Russian-improved British Rolls Royce Nene turbojet. The "Chelomey Nene," as it is called, develops more than 6,000 pounds of thrust and is the same model of engine that Gen. Hoyt S. Vandenberg called "superior to any jet engine that we have today." The auxiliary rocket unit in the after fuselage is a small variant of the German Walther rocket. It reportedly burns red fuming nitric acid and kerosene, and provides an estimated 1500 pounds of additional thrust for burst speed during combat. The rocket is not used for take-off.

Armament combinations of this "anti-bomber" plane include two 30-, 32-, or 37-millimeter cannon. The radar gear is located in the nose section. The radar gear is located in the nose section.

Science & Mechanics

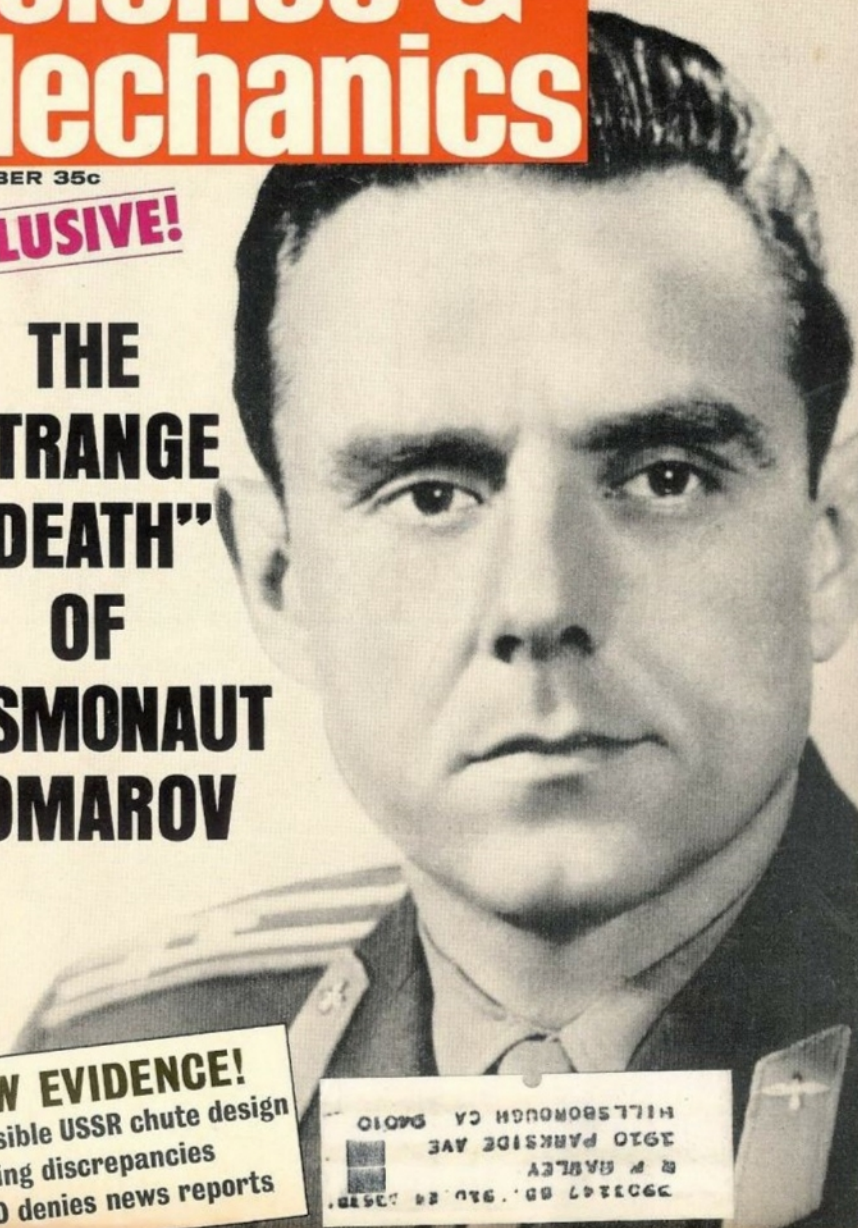
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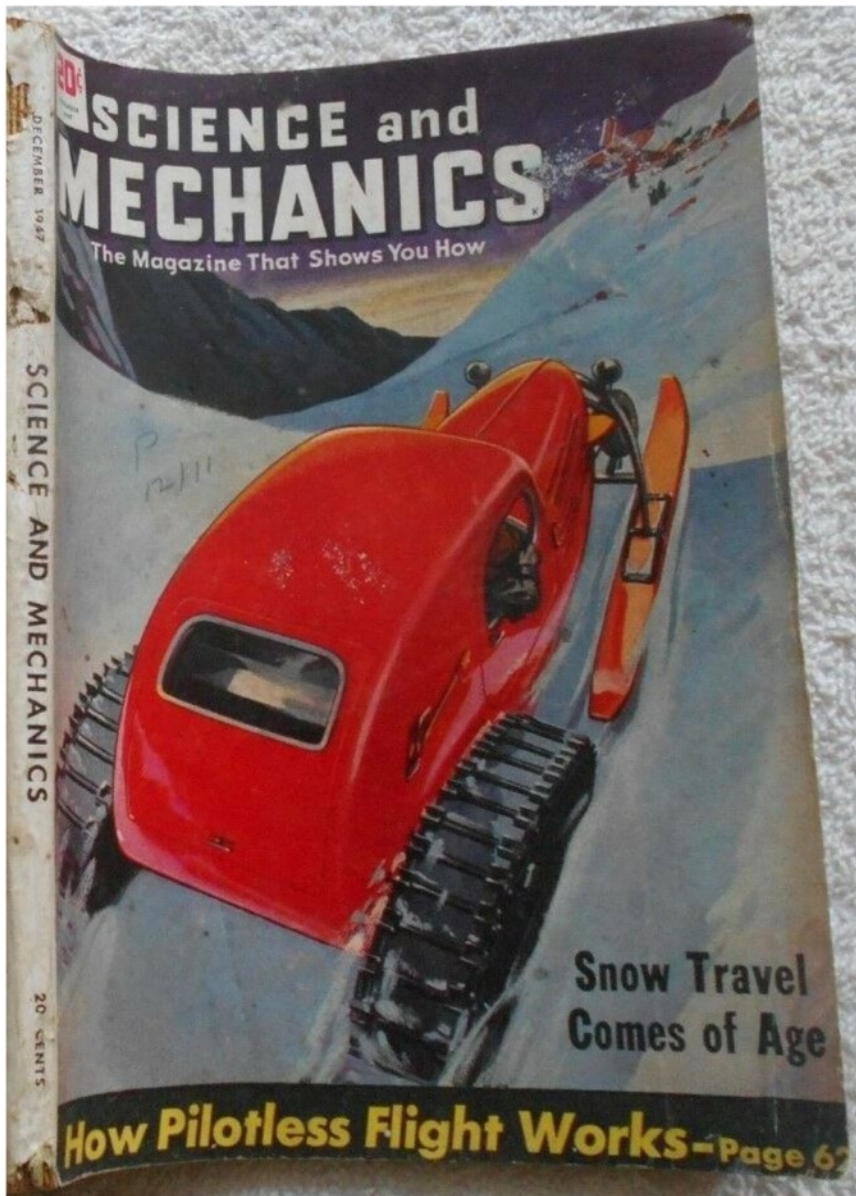
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Front view of Sno-Cat, showing wheels and steering. Right of this is designed to prevent them from slipping on slopes.

by C. B. Wing of St. Ignace, Upper Peninsula, Michigan. The U.S. Army also did some testing of more modern versions of these air sleighs. But it resisted for some rugged tests recently made in the interests of men whose life is now depending, to prove that day of isolated snow transport is unquestionably here.

Thousands of victims of ski and sled accidents have already been rescued by the Sno-Cat, pictured on the cover of this issue. Using these machines, telephone and power companies have repaired countless miles of blizzard-blasted communications lines with ease and safety, and U.S. Snow Survey crews have penetrated and measured the snows in craggy, ice-bound mountains in a matter of days—a job formerly performed by individuals on skis loaded with heavy packs, which took weeks and months of dangerous foot travel. With the enclosed and heated body of the body box deep snow drifts and black wind-swept mountain ridges are as comfortably traversed as if you were riding in your own car on a good country road.

The inventor of the Sno-Cat is Mr. E. M. Tucker of Medford, Oregon, who has worked for twenty years on solving the problem of transportation through the deep and shifting snows of mountainous terrain. Now, after grueling field tests, his 1947 model Sno-Cat has proved itself all but perfect.

The Sno-Cat is a hardworking snow traveler,

especially designed for rugged terrain. The secret of its success is the steel ski track slides over the snow, providing maximum load-carrying power for the open-cleaved, treaded drive, which "floats" around the turn on flanged ball bearings. The sprocket on the end of each track is carried by the links on top of the frame, carrying a smooth flow of power to the receiving links. These links are treated steel and travel on ball bearings, running on a tool steel track. The hollow tank can't clog, and it can glide over either deep virgin snow or ice like a ski or sled, while the



Sno-Cat with wheels down for dry running. Steering works on flanged ball-bearing segment, pivoting on axle in parallel to hanging chain.

chain provides the traction. The inventor says that there is no snow too deep for the Sno-Cat. The 9-inch wide ski runners in front do guiding, and an airplane cable-type track steering system permits 6-way ski pivot. In snow, the Sno-Cat will navigate a climb as steep as 35% with no side hill slippage. Hill grades as steep as 35% can be made to pound low over soft snow. On a recent test, the Sno-Cat made a 70% downhill grade under average mountain snow conditions. The Sno-Cat will make about ten miles to a gallon. Speeds range from 3-10 mph in deep snow, up to 15 mph on level packed snow. Auxiliary wheels lowered in front (a two-man job), the Sno-Cat can travel over bare ground. The 5675-pound sedan, carrying a 40-gallon tank and seating four people, is powered by a Chrysler six-cylinder, 115 h.p. stock motor. It incorporates a Dodge low ratio rear end and a speed transmission.

A light-weight ski-type trailer which will carry freight or passenger loads up to 1500

has been designed for the sedan. Tucker is at present making his Sno-Cats in two additional models—a medium 7-passenger sedan, and a 10-passenger freighter capable of pulling a specially built ski trailer with a capacity of 30 passengers or four tons of freight. The freighter is powered by a 140 hp 8-cylinder Chrysler engine, and has larger postures. Accessories include siren, spotlight, climb and bank indicator, cab heaters, hot food warming compartments, overhead ski and luggage racks, radio, and rubber overshoes which are put over the steel links when driving on pavements.

The Sno-Cat is now providing safe dependable transportation for rescue work, contract hauling, mail, motion picture trips, mining, trapping, snow surveys and field work for telephone, water, power, and railroad companies. Resort owners have also found it useful as a taxi for guests, and for hauling freight, as well as a versatile and mobile ski tow.

So much for the workhorse variety of snow travel. For less rugged terrain, where greater speeds are possible, propeller-driven sleds such as the Snoplane (shown in accompanying photographs) are used. At least 20 of these Snoplanes, invented by Thomas W. Price and How-



To make Sno-Cat's skis, hickory wood is steamed in tanks, bent over and bolted into shape on forms, and left to dry.

ard Davis of Durango, Colorado, are now in operation in Alaska, Wyoming, Canada, California, and elsewhere. They are busy at such jobs as rubbing reindeer ranges of timber wolves, rushing expectant mothers to hospitals, rescuing snowbound power line maintenance workers and stranded motorists, and bringing back airplane crash casualties.

The Snoplane is actually a 3-runner, 4-passenger, enclosed, direct propeller-driven, pusher

type vehicle. It is just the thing for travel at high speeds over level snow, but it also can be slowed down to 5 or 10 mph to negotiate difficult and hazardous terrain. It has been clocked at 65 mph through wet snow, while pulling 4 men on skis, carrying one on the runners, and with three passengers in the cab.

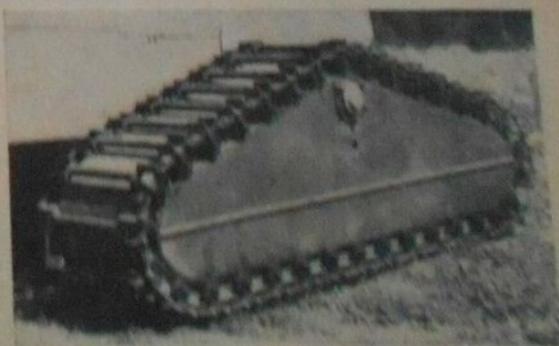
Fred Abercrombie, Jackson, Wyo., service station operator who owns a Snoplane, a few years ago rescued four snow-bound telephone maintenance men who had been lost for four days and brought them back to safety in his Snoplane.

Again, in 1944, he ferried out the bodies of 24 victims of an airplane crash. But it isn't all work for Mr. Abercrombie's Snoplane. He has a trap door in the bottom of the vehicle. He drives out on Jackson reservoir in the winter and chops a hole in the ice, which sometimes attains a three-foot thickness. Then he drives the plane astride the hole, and fishes in comfort from the cabin, catching Mackinaw and rainbow trout!

Stanley R. Marean, superintendent of the Wyoming reclamation service, is making good use of a Snoplane on snow surveys in the Jackson Hole watershed. This work formerly was done by men on skis who were exposed to extreme cold, rifled shelter cabins and other hazards. The party of one surveyor and pilot recently made one trip of 128 miles in 11 hours and 25 minutes. Soft snow and a temperature of 23 degrees below zero prevailed and normally the trip would have required 10 days on snowshoes and skis with great physical effort and discomfort. On one watershed survey route the Snoplane has been in operation for five years and rolled up an estimated 195,000 miles.

Jack Westfall, Golovin, Alaska, is the man who uses a Snoplane to hunt timber wolves on a commercial reindeer ranch. He hunts with an aviator companion who spots the wolves and notifies Mr. Westfall of their location. The Snoplane pilot takes after his quarry, runs them down in deep snow, and kills them with rifle or shotgun.

Mr. Price, the Snoplane's inventor, is now

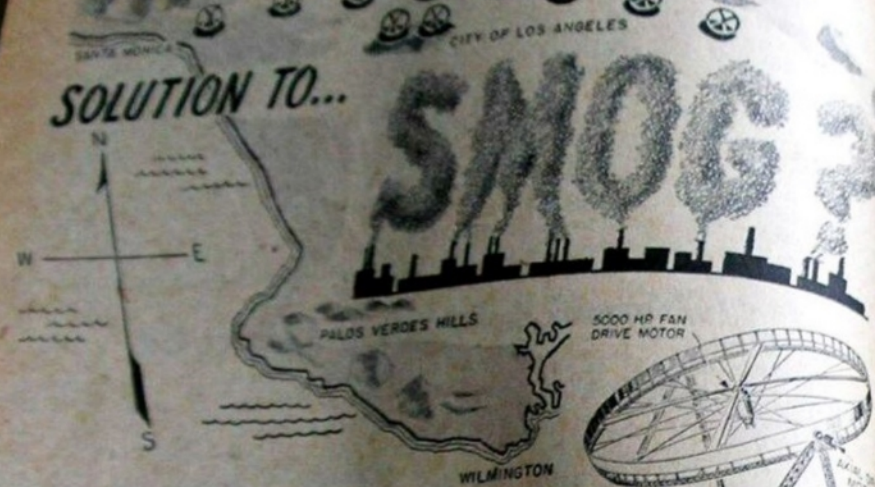


Stainless steel postbox provides buoyancy. Tracks, driven by sprocket wheel, "float" around on postbox on ball bearings.

December, 1947

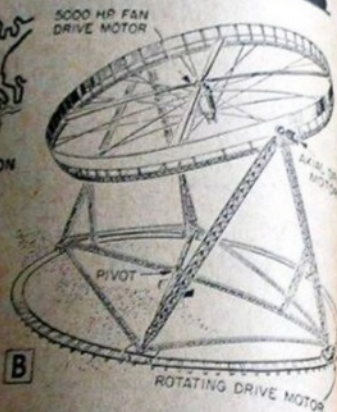
SOLUTION TO...

SMOG



A PACIFIC OCEAN

Giant windmills (B) are proposed as a triggering device to help nature remove the smog collected under the inversion layer over the Los Angeles Basin (A). Located close to the mountains in these artist's drawings, ten windmills create artificial updrafts forcing cool air in a column from the ground to the base of the warm air of the inversion. Once the inversion layer is pierced, smog can rise above it where upper level winds can carry it over the mountains and dilute it to a point where it is harmless to life.



By CHRIS JOHNSTON

OG costs every citizen of the U.S. about \$10 a year in higher prices for food and higher prices for manufactured goods. Farmers in the Los Angeles Basin alone estimate they lose a year in damaged crops and industry is losing over 250 million a year to eliminate smog. The waste from its smokestacks. This cost is passed on to you through higher prices.

Los Angeles bears the brunt of smog costs. To clean up the need to redecorate the health hazard of pollution over 1630 sq. miles of the Los Angeles area is particularly afflicted because the north and east stop air movement. The inversion layers.

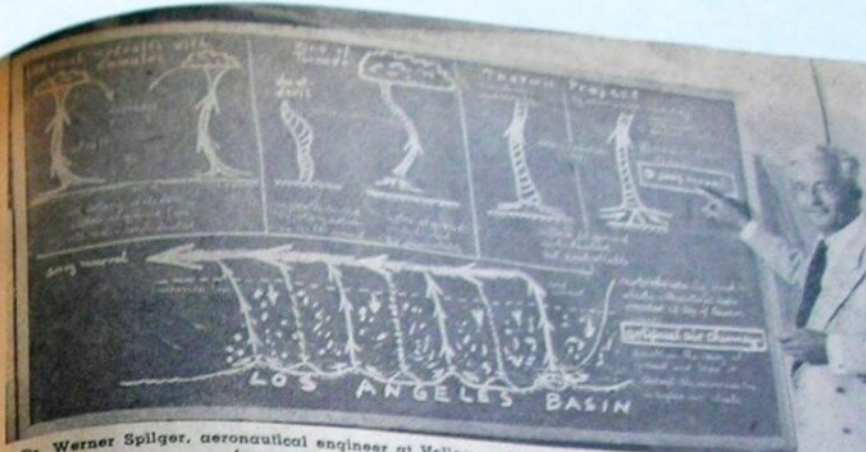
cut off horizontal movement of air. The temperature inversion, that is, when the air is warmer above the surface than at the surface.

version layer breaks up.

Millions of dollars are now being spent in research to determine the components and conditions that form smog and eliminate them, however, scientists estimate they need five years for their research. As industry and population in the area continue to grow, a more immediate solution is necessary.

Dr. Werner Spilger, scientist at the Holloman Air Force Base, suggests using windmills to blow holes in the inversion layer and force smog up a column of air to an altitude where it can be carried over the mountains by high level winds.

Dr. Spilger's windmills will be 150-ft. in diameter, mounted on a vertical axis atop 90-ft. towers. Driven by a 5,000 hp turbine engine, he estimates each windmill will draw air from the surface and force it up to an altitude of 300 ft. where it can be carried away by upper level winds.



Dr. Werner Spilger, aeronautical engineer at Holloman Air Force Base, explains the theory behind a system of smog-dispersing windmills in the Los Angeles area.

according to Dr. Spilger.

The base of an inversion layer is usually marked by flat sheets of clouds (stratus). These clouds reflect or absorb the sun's radiation before it has a chance to reach and warm the earth's surface. An increase of 1°C will dissolve a stratus cloud 300-ft. thick. That's why, in many areas, a temperature inversion may break up in the afternoon as the sun has a chance to warm it.

The windmills will draw relatively cold, humid air from the ground level and force it upward. In nature, such an updraft forms clouds, too, but warm air begins settling toward the ground under the cloud. This vertical air exchange gradually mixes the cold and warm air till the temperature is equalized.

By breaking up the stratus clouds with artificial updrafts, more of the sun's radiations will reach the ground to warm it, reducing the inversion and creating natural updrafts. The smog can then rise above the mountain tops where upper level winds can carry it away.

Dr. Spilger estimates ten windmills can do an effective

he estimates the cost for a windmill to be less than the amount now spent on anti-smog measures taken to control smog.

In addition to smog dispersal, Spilger believes his windmills could reduce crop losses by warming the ground. The windmills would be forced up by the warm upper air would settle to lower temperatures.

Because the windmills are used to create natural air flow, they would need to operate approximately 4 hours a day. On the other hand, breaking forces have been triggered by turbines could then be used for the city's use.



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Details on the NX2—Atomic Plane

OUR long-awaited atomic-powered airplane—Convair's Model NX2—is finally on the drawing boards, its components in various stages of construction and testing.

After 14 years' research and an investment of close to 1 billion dollars, the plane's reactor is under test and two different engine systems, both slated for early flight testing, are in advanced development.

What will take to the air sometime in 1964 over sparsely populated western terrain and along 50-mile-wide "radiation corridors" promises some surprises for old-hand plane watchers.

America's "hottest" bomber, big as a B-52, will have swept back wings and non-orthodox tail control surfaces. Although the NX2's vital statistics are still shrouded in secrecy, the ship soon to be constructed at Convair's plant in Fort Worth, Texas, will measure some 180 ft. from nose to tail and have a wingspan of about 150 ft. Its wings will carry no engines except for two conventional jet

When will our "hottest" bomber take to the skies? How will it perform? What about the radiation danger? Here are the answers

By JAMES JOSEPH

boosters planned for experimental flights (Fig. 5). Thus the plane will have thrust and broader wings than the B-52 to balance its tail-heavy reactor and radiation shield. Control surfaces on the vertical and horizontal stabilizers will be smaller than for planes of comparable size. This is because the plane's center of gravity won't shift as it does on jet planes as they consume fuel. A pound of fuel probably will carry the NX2 about 14,000 miles and keep it aloft for hours or more.

Reactor Is Heart. A shielded, spherical

actor, heart of the NX2, will contain uranium 235 or plutonium 239, both easily fissionable materials, as fuel. The reactor—and there's a possibility that there may be two of them—acts as the source of the heated air that provides thrust.

A single gram (or about 0.035 lbs.) of reactor fuel generates about 1 million watts during a day's fissioning and boosts the reactor's temperature well above 1,200 F.

Capt. Thomas L. Jackson, an Air Force nuclear technologist, has estimated that to power a nuclear bomber at near the speed of sound and to altitudes of 35,000 ft., a reactor must supply "in the neighborhood of 300 mgw."

A view of the complex test stand for GE's atomic engine test at Arco, Idaho. Reactor and engines shown in Fig. 4 were built on a railcar that was then rolled into the radiation-proof test room shown in Fig. 6.

This photo shows a model of the NX2 atomic-powered airplane and part of its ground support equipment. Design serves the double purpose of protecting control surfaces from jet blast and isolating the crew from the reactor.

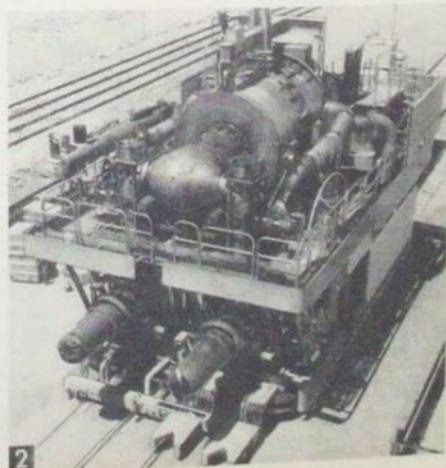
While this figures out to about 0.65 lbs. of atomic fuel a day, actually the "fast" reactor under development for NX2 is said to be far more efficient. A dwarf compared to ordinary power reactors, it nevertheless squeezes far greater power from a gram of reactor fuel.

Fast reactors differ from bigger, less volatile reactors in that they usually contain neither control rods nor moderators (see p. 93, Aug. '60 S&M).

In the absence of control rods, fission is regulated by moving the fuel elements or reflector segments in the reactor's core to increase or decrease the number of neutrons and thus the rate of fission. One nuclear technician suggests that NX2's fast reactor may be controlled by a rotatable drum, coated on one side with boron, an element that captures neutrons. Controlled from the cabin, the drum's boron side can be rotated to absorb neutrons and thus slow or stop the fission process.

Two Possible Power Systems. While NX2's reactor is under test at the AEC National Reactor Test Station, Arco, Idaho, two jet engine systems are in advanced development.

General Electric's direct cycle power plant sucks air directly through the reactor's radioactive core (Fig. 4). Piped to the jet engines, the superheated and compressed air expands violently. Blasting from exhaust ducts, it drives the ship forward.



How to Earn \$20 in an Hour or Less *see page 104*

SCIENCE and MECHANICS

35c MAY

Dodge Darts Compared:

Stock vs. Ram Induction

Bonus Insert

Full-Size Nail Chart
for Your Workshop

Science Fair Projects:

Van de Graaff Generator

Chemalloy - a new
alloy for researchers

Bernoulli's floating
ball experiment

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Make Your Own
Blueprint Machine

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Electronic Watchdogs
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The Look of Phones to Come

One of these days you won't even recognize your telephone. You'll see some new designs this year and next, but other "blue-sky" models are farther off

By ROBERT A. KELLY

ONE of the most common articles we encounter every day is undergoing some radical changes. These changes, in both the look and operation of today's telephone, will—in the not too distant future—make it possible for you to:

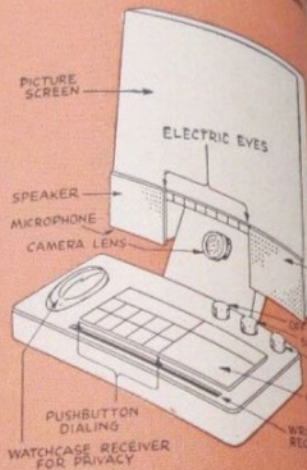
- See, and be seen by, in 3-D color, the person to whom you're talking.

Make and receive a call anywhere—from our car or even walking down the street.

- Transmit business information locally and at high speed over telephone lines.

These are just some of the models and improvements you will be seeing in the coming years. Some of them are already in use on a limited, test basis; it's largely a problem now of putting complex installations that the phone require and miniaturizing existing

Seeing Your Caller is still a long way off—conservatively estimated at 10 years.



2 Bell Laboratories engineers envision one use for this television-telephone, the Picture Phone, in an executive's office. Here a secretary uses one of the knobs to decrease volume. Lens at the top of the set transmits her picture.



3 If you hear a telephone signal on the street, chances are someone is being paged on the Bellway. This little instrument will let you know if someone is trying to get in touch with you.

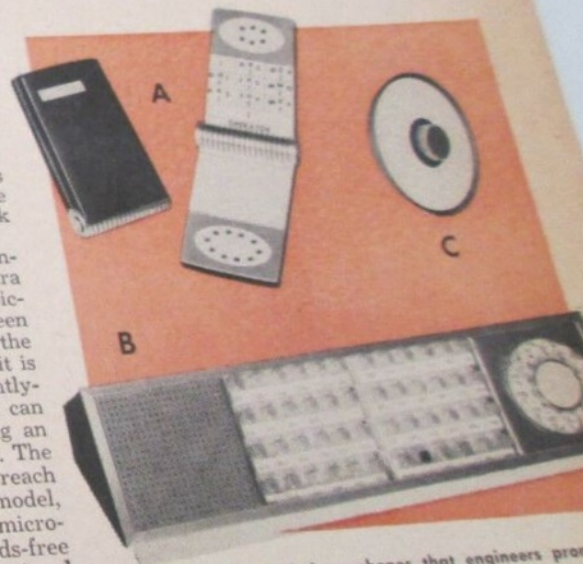
ponents for such a system right now.

The problem lies in putting these together and, more difficult still, making it possible to transmit a television image over telephone lines.

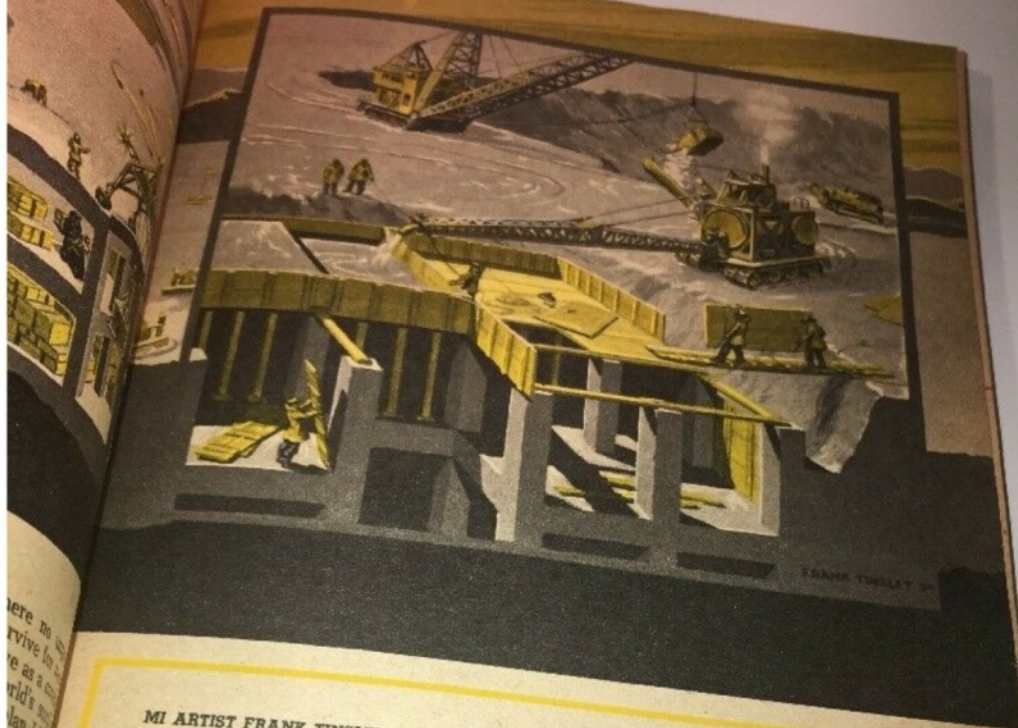
The Picture Phone (Fig. 2), developed by Bell Laboratories is a model of what they believe the see-your-caller phone will look like.

A small desktop unit, it contains a miniature TV-type camera lens for transmitting your picture plus a small viewing screen that shows the person at the other end. Included in the unit is a "repertory" of 66 frequently-called numbers, all of which can be reached by simply setting an indicator and pressing a bar. The push-button dial is used to reach other numbers. In one model, they've provided both a microphone-speaker unit for hands-free operation and a conventional handset.

Engineers at Automatic Electric Co., Northlake, Ill., have made some giant steps with their Telesight (Fig. 1). This design calls for a 3-D color picture and



Here's a round-up of three phones that engineers plan to see sometime in the '60s. A handy Personal Telephone (A) lets you make a call wherever you were. The executive Loudspeaker (B) combines ordinary intercom principle with the Phonetic Phone you never have to pick up. The Arabian Nights—say the right word and you're automatically connected with your partner.

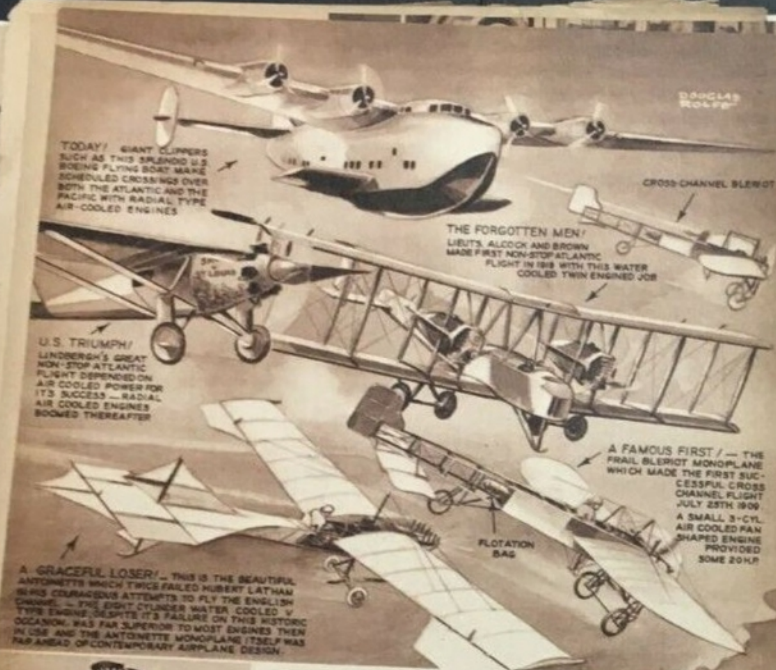


MI ARTIST FRANK TINSLEY has given us, in the above two-page illustration, his conception of what the typical Antarctic storage base might look like. Frozen food is unloaded from refrigerator ships at left onto huge helicopters which, in turn, fly it directly to the underground warehouses ashore.

These installations consist of a number of deep-freeze storage chambers, built on multiple levels around a central service shaft. The top of the entrance shaft is fitted with frozen-in coamings over which a weather-proof hatch cover is fitted. This cover is equipped with four wind-driven ventilators. Two of these draw in the cold surface air and circulate it through the lower levels via ducts built into

the central columns and floors. The other two ventilators are for exhaust purposes. Anchored into the center of the hatch cover is an igloo-like structure that serves as a vestibule and engine control room for the warehouse below. And atop the storage unit is a tall staff bearing a numbered identification flag.

A simple, cheap method of constructing these deep-freeze units would be to build them from the surface in deep, blasted out pits, as seen on the right, using tried and true techniques of concrete-frame building erection. The only difference would be that melted snow-water would replace the concrete mix. Once poured in place, it would freeze solid almost immediately.



TODAY! GIANT CLIPPERS SUCH AS THIS SPENDING U.S. BOILING FLYING BOAT MAKE SCHEDULED CROSSINGS OVER BOTH THE ATLANTIC AND THE PACIFIC WITH RADIAL TYPE AIR-COOLED ENGINES

CROSS-CHANNEL BLERIOT

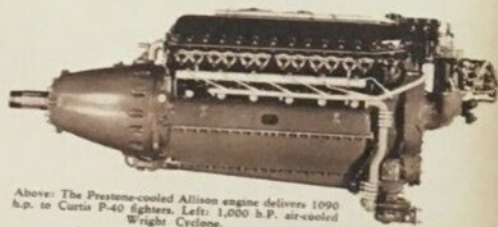
THE FORGOTTEN MEN! LIEUTS. ALCOCK AND BROWN MADE FIRST NON-STOP ATLANTIC FLIGHT IN 1919 WITH THIS WATER-COOLED TWIN-ENGINE JOB

U.S. TRIUMPH! LINDBERGH'S GREAT NON-STOP ATLANTIC FLIGHT DEPENDENT ON AIR-COOLED POWER FOR ITS SUCCESS—RADIAL AIR-COOLED ENGINES BOOMED THEREAFTER

A FAMOUS FIRST!—THE PRAIL BLERIOT MONOPLANE WHICH MADE THE FIRST SUCCESSFUL CROSS-CHANNEL FLIGHT JULY 25TH 1909. A SMALL 3-CYL. AIR-COOLED PAX SHAPED ENGINE PROVIDED SOME 20HP

A GRACEFUL LOSER!—THIS IS THE BEAUTIFUL ANTONETTE WHICH TWICE FAILED HUBERT LATHAM BEING COURAGEOUS ATTEMPTS TO FLY THE ENGLISH CHANNEL. THE EIGHT-CYLINDER WATER-COOLED V TYPE ENGINE, DESPITE ITS FAILURE ON THIS HISTORIC OCCASION, WAS FAR SUPERIOR TO MOST ENGINES THEN IN USE AND THE ANTONETTE MONOPLANE ITSELF WAS RAPIDLY OBLITERATED BY CONTEMPORARY AIRPLANE DESIGN

Above: These planes of the past and present seem to indicate that both air and liquid-cooling can bring fame. Latham's water-cooled ship set a duration record—1 hour, 9 minutes.



Above: The Prestone-cooled Allison engine delivers 1090 h.p. to Curtiss P-40 fighters. Left: 1,000 h.p. air-cooled Wright Cyclone.

line engine is seldom more than 25% efficient. Much of the wanted energy is used to heat the air that passes through the radiator or around the cooling fins. Engine cooling, therefore, is really a matter of finding the best way to waste the energy that engineers don't know how to use.

Just imagine what your electric bill would

be if you plugged in an array of electric heaters and tried to keep 1,000 pounds of steel hot all day long—while a giant airplane propeller drove a constant icy blast to combat your efforts! The bill you would receive would give you a clear idea of the energy lost through the cooling system of an airplane engine. Every unit of 746 watts used would



Above: Vought-Sikorsky XF4U-1. It staged a cooling upset.

represent one horsepower lost. No method is known at present, however, to utilize the excess heat that must be dissipated through the cooling system. Only a relatively small amount of heat is actually needed to maintain the proper temperature in the manifold for vaporization.

Another fact about liquid-cooling that is seldom mentioned is the improved effectiveness of modern coolants. Certain cooling liquids commonly regarded merely as "antifreeze," are really more effective coolants than water. Their ability to rid the engine of excess heat with greater efficiency than water, permits the use of smaller radiators. This, of

course, reduces the drag of an aircraft in flight. An example of this is to be found in the Prestone-cooled Allison engine used in the Curtiss P-40. Two tiny cylindrical radiators cool the 1,090 h.p. engine.

With the super-coolants of today and the resultant reduction in radiator size, fluid-cooling boasts of a definite advantage for military aviation use. The sleek fuselages possible with slender, fluid-cooled motors, afford excellent visibility to the pilot. The only way this can be approached with air-cooled engines is found in the inverted "V" engine, in the inverted tandem, or special fuselage designs. This fact no doubt accounts

Below: Cooling systems in modern American war planes.



AMERICA'S FASTEST!—THE NEW VOGHT-SIKORSKY SHIPBOARD FIGHTER—AN OUTSTANDING EXAMPLE OF AIR-COOLED INSTALLATION

A NEAT CHASER! THE TRIM VULTURE VANGUARD—MOST RECENT EXPONENT OF LIQUID-COOLED POWER

ALLISON LIQUID COOLED ENGINE

FAT BUT SLEEK! THE GRUMAN NAVY FIGHTER EMPLOYS AN AIR-COOLED RADIAL—IT IS FAST

BELL'S "AIRABONITA" AN INTERESTING DESIGN IN WHICH THE ENGINE IS PLACED AHEAD—GREATER PILOT PROTECTION AND MANEUVERABILITY RESULT

100-M.P.H.

STEAM TORPEDO BOAT

An interview with F. M. Bellanca, noted Airplane Designer
by George Daniels

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DOUGLAS
ROUSE

THE fastest and most destructive torpedo boat in the world has just passed the design testing stage, and is now being readied for mass production. Born in the mind of one of America's world famous airplane designers, F. M. Bellanca, this sensational warcraft is amazing even to men who know the bloody toll our torpedo boats have already taken of the enemy.

But to Designer Bellanca it is more than just a mighty war weapon—it is the victory contribution of a man who, as Chairman of the

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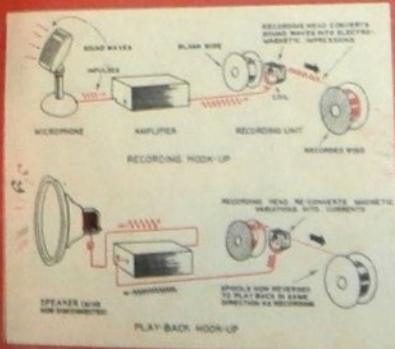


BY WILLIAM F. LEAR
GEORGE B. LEAR

HAVE you ever wanted to record a symphony, a radio program, or a new tune that you have never heard before? The answer is yes, because recording is so easy now that it has become a household word. The modern wire recorder has changed the manner in which we think entirely. It is so simple that a five-year-old child can operate it. All you have to do to make a recording is push a button. Instead of a wax disc, your record is a spool of practically indestructible steel wire. It never wears out no matter how many thousands of times you play it. You needn't worry about needles wearing out because the wire recorder has no needle. A final touch to this seemingly unbelievable system is the fact that you can entirely erase everything from a wire recording and use the same wire over and over if you can find time enough. On the other hand, if you like what's on the wire you can leave it there forever and play it for your grand-

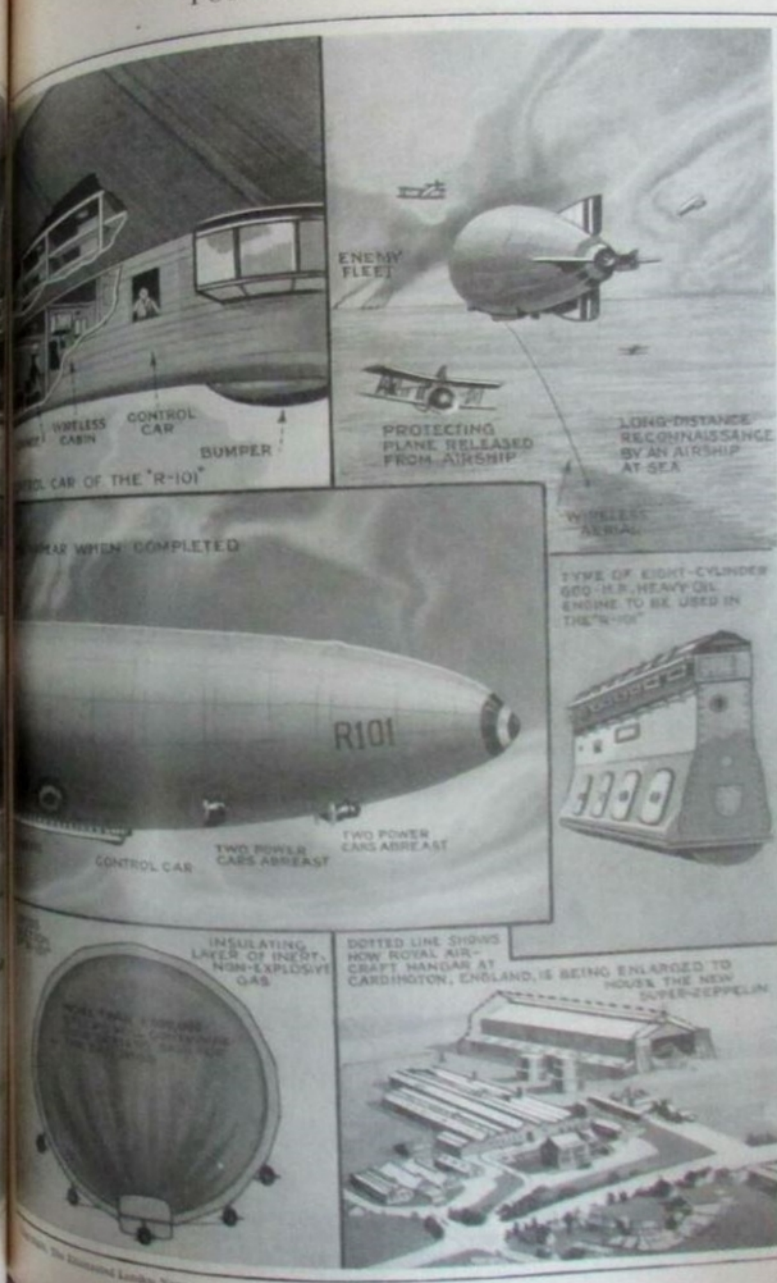
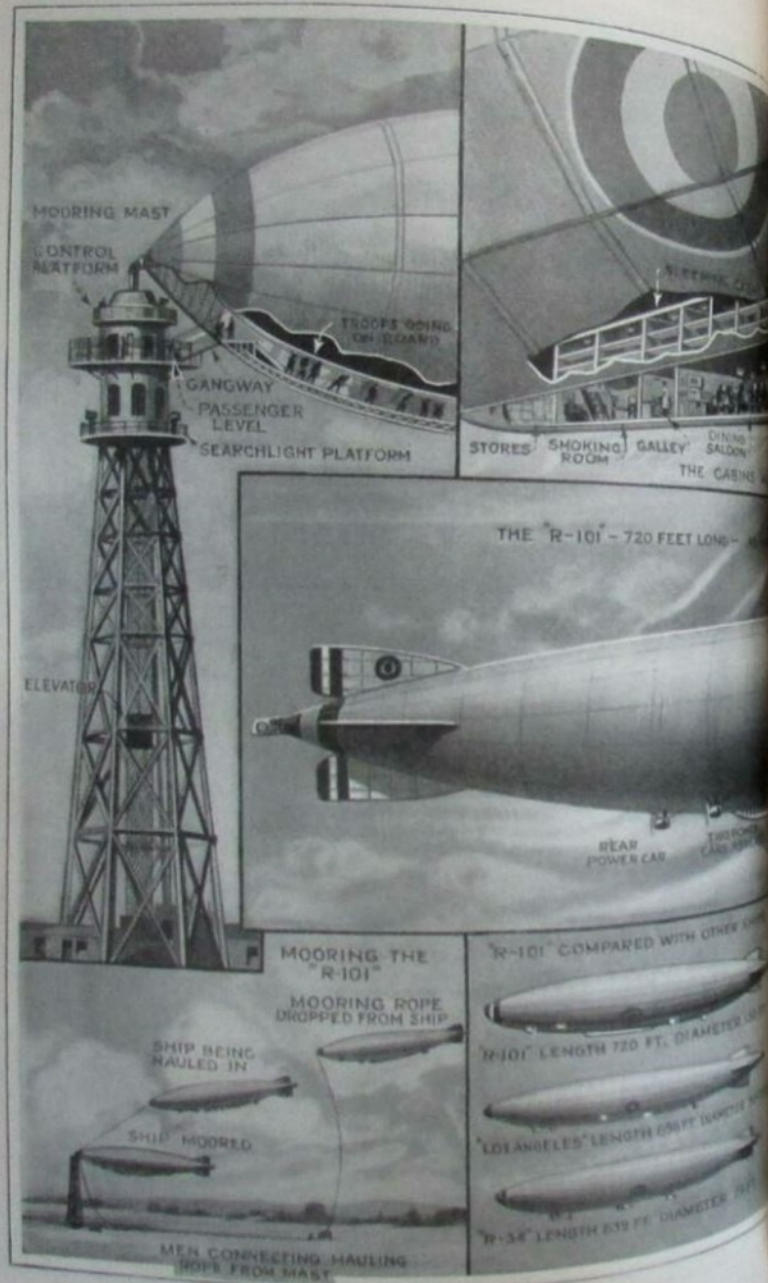


William F. Lear, President of Lear, Incorporated, holds wire recording cartridge. Lear pioneered automobile radio, won 40 Frank Hawks Award.



DOUGLAS WOLFE

Designed by Douglas Wolfe, Inc., the Lear wire recorder is a simple, easy-to-use device for recording and playing back sound. It is a perfect example of modern engineering and design.



Relaxing Gas— Latest War Weapon



**Battles will be bloodless
when nations start using
this gas which destroys
the will to fight back.**

By Frank Tinsley

A FLEET of long-range bombers corkscrews through a hole in the city's defense net with its fighter escorts running interference. Bomb-bay doors whip open and rack loads of queer, green-painted cylinders are gracefully earthward.

Below, the sweating ack-ack crews stare at each other in weary surprise. The first bombs have landed yet no deadly atomic mushrooms have sprouted skyward! Only a soft, persistent thud—

can we

ATOMIZE the ARCTIC?

Will the atomic bomb and UNO combine to make a world of beauty and industry out of what is now but frozen waste?

BY WALLACE W. ASHLEY AND ELMER V. SWAN

"EVERYBODY talks about the weather but nobody does anything about it." So quipped Mark Twain, with perfect truth, in the years just before the dawn of the atomic era.

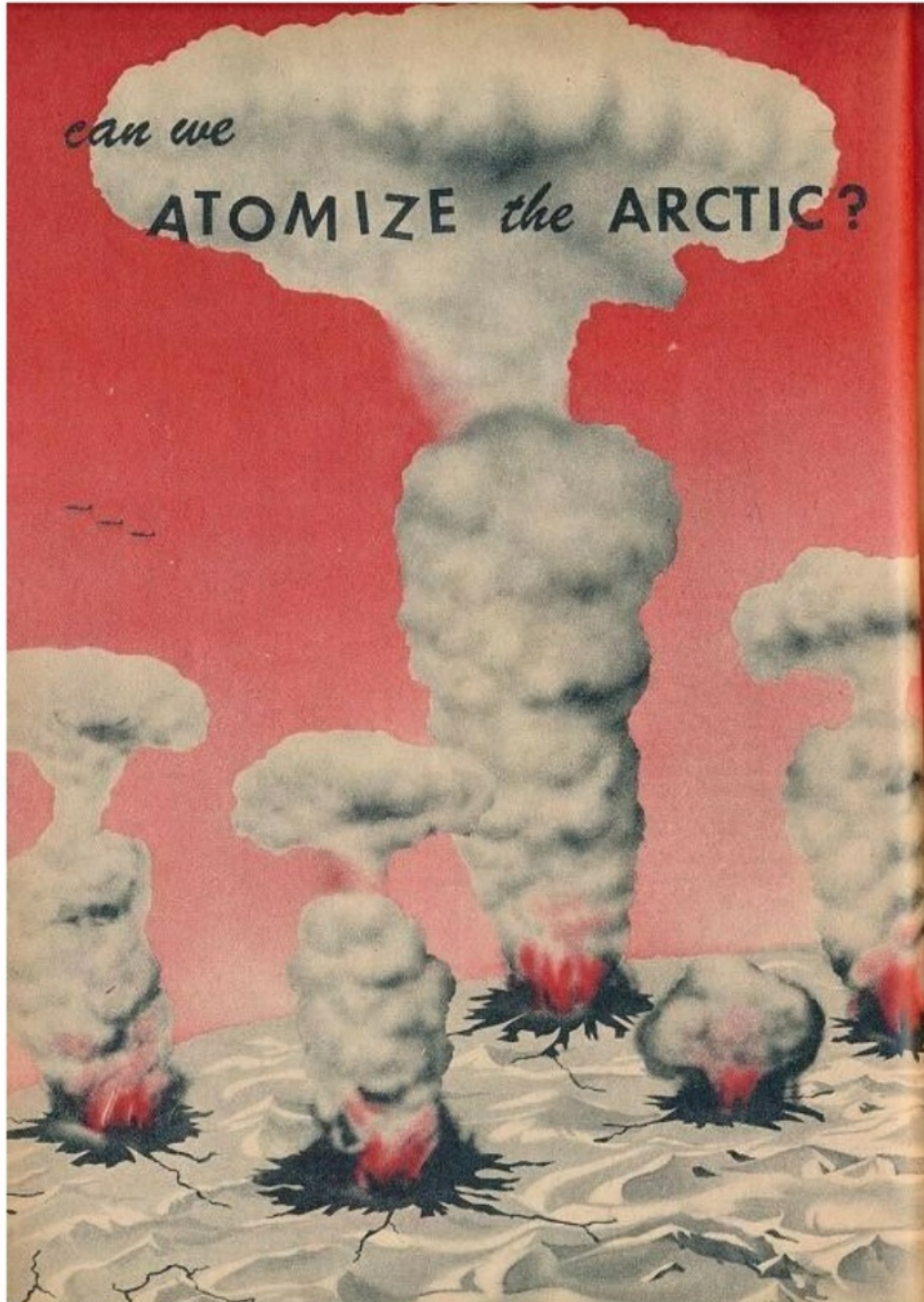
Now something *can* be done about the weather, however—by using atomic energy to perform a gigantic "defrosting" operation on old Mother Earth's northern refrigerator. Professor Julian Huxley has mentioned this possibility, and touched off a discussion on the feasibility of such a project and its benefits to mankind.

Most of our weather comes directly out of the North. Eliminate or modify the influences that make that weather, and the climate of our entire northern hemisphere would undergo radical changes. Rid the polar region of the vast ice-sheet and you would remove the occasional "cold snaps" that freeze water pipes and tie up metropolitan transportation as far south as St. Louis and Washington.

The vast wastelands north of the Arctic

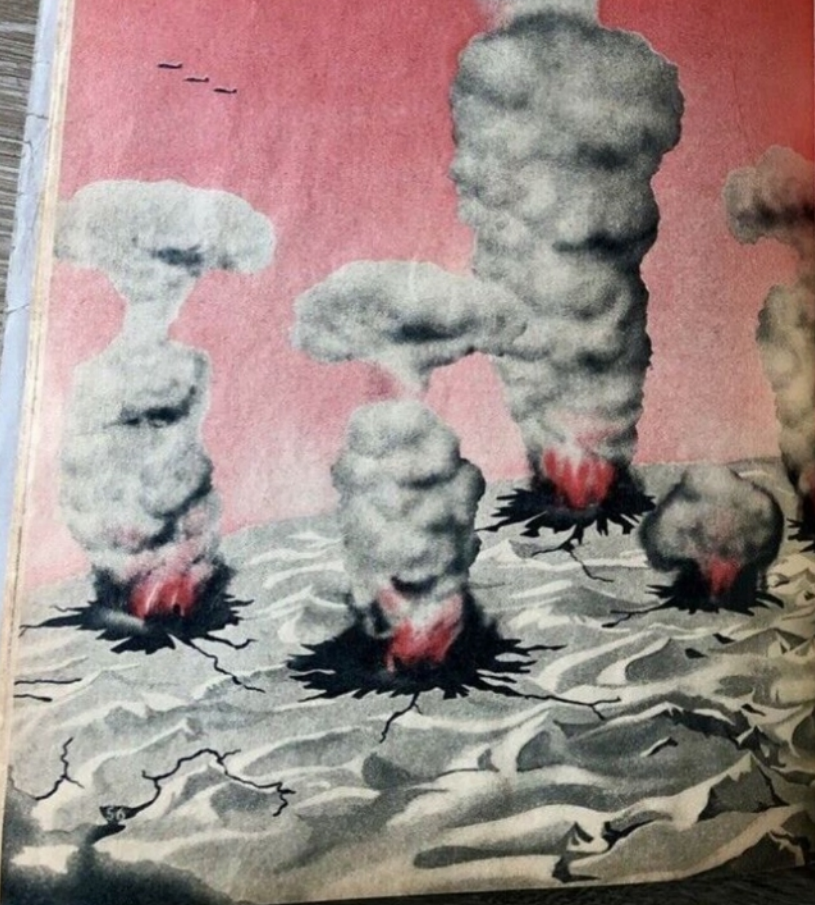
Circle would be opened up to mining and agriculture. Intercontinental airlines using intermediate refueling bases could fly the Great Circle route regularly. Warm-water ports, open the year round, could become a reality along Hudson Bay, Siberia's Arctic shores and the White Sea.

Can the Arctic ice be eliminated? Huxley believes this age-old dream of scientists and economists has come much closer to realization with the arrival of atomic energy. The terrific heat generated by nuclear fission would melt large areas of ice. A series of well-placed atomic blasts would cover an area great enough to make the results effective. Whether the "bombs" should be dropped from planes, as in the case of Hiroshima and Nagasaki, or whether towers should be constructed for remote control operation, as was done in the original test in the New Mexico desert, would be determined by a commission of scientists and economists.



can we

ATOMIZE the ARCTIC?



...atomic bomb and UNO combine to make a world of
...and industry out of what is now but frozen waste?

BY WALLACE W. ASHLEY AND ELMER V. SWAN

...talks about the weather
...does anything about
...Mark Twain, with per-
...the years just before the
...era.

...can be done about the
...using atomic energy
...defrosting" oper-
...Earth's northern re-
...Julian Huxley has
...possibility, and touched
...the feasibility of such
...benefits to mankind.

...weather comes directly
...Eliminate or modify
...that make that weather,
...of our entire northern
...undergo radical
...would remove the oc-
...that freeze water
...metropolitan transpor-
...as St. Louis and Wash-
...lands north of the Arctic

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by a commission of scientists and econ-
omists.



Deadlier than the atom bomb

BY WILLY LEY

Does the United States possess a weapon "far more formidable than the atomic bomb?" Is it a lithium bomb? The "lithium reaction" is known to power some of the stars.

It would not save us to build our cities underground: an atomic bomb, exploded on the surface, would destroy them utterly (right). A lithium bomb might be much worse. An uncontrolled chain reaction would blow up the whole earth!



FOR some time now there has been much speculation whether the United States possesses an even more destructive weapon than the atomic bomb and, if so, what it could possibly be. It all started with a remark made by a Congressman about a "weapon far more formidable than the atomic bomb itself," followed by the apologetic state-

ment "I guess I have said too much."

What did he have in mind when he made that remark?

One newspaper commentator said that the weapon was based on cosmic rays, which does not mean much in itself since cosmic rays are simply rays of a very high power of penetration. Some observers guessed at biological or germ warfare. The remainder of the observers were divided into two camps of

very unequal size and strength. A few suspected that the whole incident was purely political in nature and not backed by anything tangible. Most decided that a new development in atomic weapons was behind all this.

There are several possible developments in atomic weapons, though it is doubtful if any has reached a finished state in light of the assertions of the top men in the atomic field, that vir-

Mechanix Illustrated

December, 1946



plane swallows auto!

Photos by Rudy Arnold

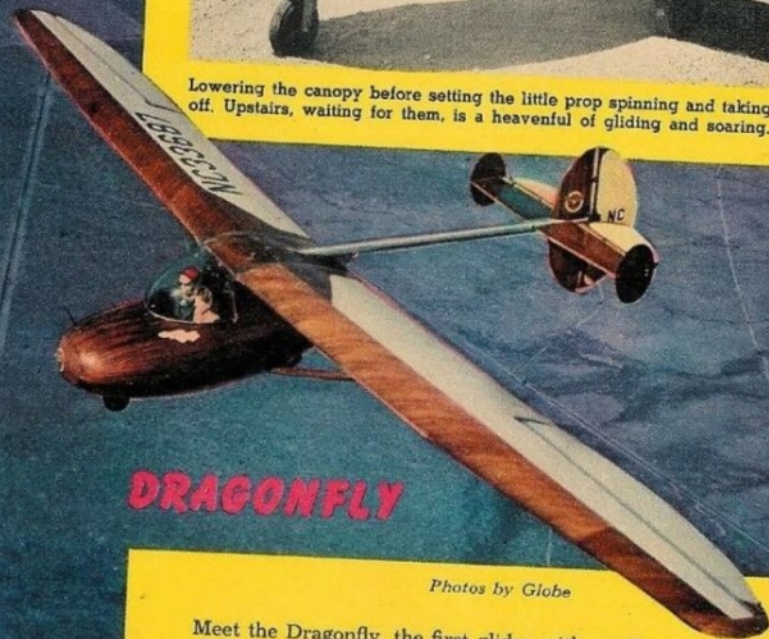


THE giant maw slowly opens. An automobile—or any vehicle with a wheel loading up to 5,000 lbs.—drives up the ramp and disappears inside. An electric pump energizes the hydraulic jacks and the mouth closes. Two 14-cylinder, 1,675-hp, sleeve-valve engines turn up the four-bladed Rotol props and the bulky mouthful of freight is soon on its airbound way at 180 mph.

This mechanical Moby Dick is the product of the Bristol Aeroplane Company of England. It plans to build one hundred of these flying Freighters this year, including a 32-passenger version called the Wayfarer. The dimensions of the Freighter's main cargo hold permit installation of all kinds of special containers, racks and equipment with which the plane can be quickly converted from one type of hauling to another. Pilot and co-pilot are accommodated in a cabin above the hold. Wing span is 98 feet and maximum all-up weight is 36,500 lbs. •



Lowering the canopy before setting the little prop spinning and taking off. Upstairs, waiting for them, is a heavenful of gliding and soaring.



DRAGONFLY

Photos by Globe

Meet the Dragonfly, the first glider with auxiliary engine in aircraft history.

Dragonfly's quite a gal. She has a fuselage of plastic plywood. A dural boom extends back to support her tail surfaces. Her cockpit seats two and has dual controls. There's a Plexiglas bubble canopy which can be removed for open-cockpit flying. Landing gear is of tricycle type, retractable. Her wings are detachable for easy storage. Her powerplant is a 2-cycle, 4-cyl. engine developing 25 hp at 3,900 rpm and weighing only 50 lbs.

Performance figures, based on gross weight of 935 lbs., are: cruising speed, 65 mph; rate of climb, 240 ft. for the first minute of climb; sinking speed, 4.8 ft. per second; gliding ratio, 18 to 1; take-off run, 900 ft.; stalling speed, 38 mph; fuel consumption, 3 gal. per hour.

She wears a brand new NC, awarded after one year of exhaustive tests. Nelson Aircraft, who makes her, is kind of proud.

Yessir, she's a glider—but she takes off like any light plane, can grind her way through the dead-air patches, and uses wind or engine or both.



In a Giant Wing

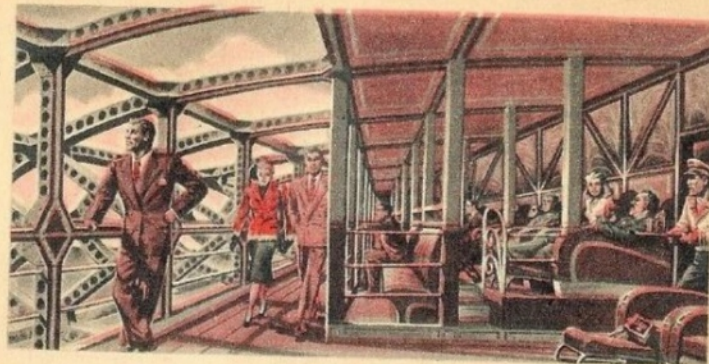
continued...

"City of London" and the Purser greets her with a welcoming smile.

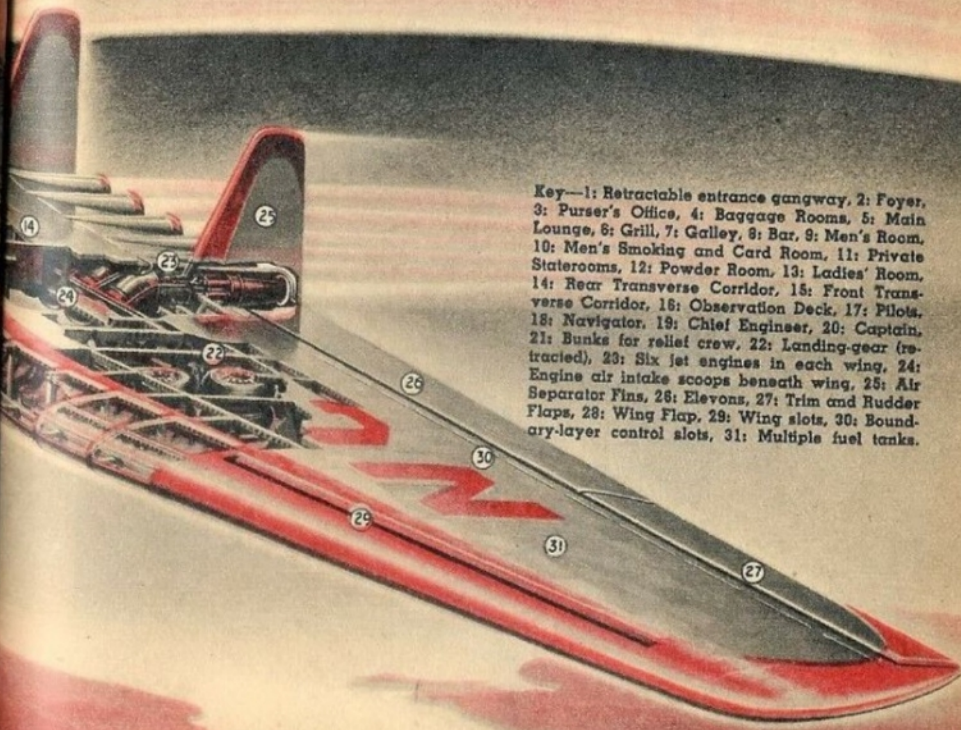
A moment later, he phones the "all passengers and crew aboard" to the bridge and relays an order to a waiting engineer. Instead of following Jill into the lounge, I linger in the foyer to watch them seal up the ship. Opening a small panel in the after bulkhead, the crewman nonchalantly punches a button and a hidden electric winch hums. The lower section of the gangway, mounted on what seems to be a

filing cabinet type of roller suspension arms, is drawn upward over the upper section on rails built into the upper section's side girders. As its rubber-tired rollers drop off the top of the rails and lock, another pair of cables swing the telescoped gangway up into its well in the flap. The smooth under-surface of the upper section forms a flush door that closes the entrance opening and restores the flap's airflow contour.

As I watch the swift, smooth opera-



The leading edge is glassed in with double walls between which warm air is circulated to heat the promenade. Farther back are reserved deck chairs.



Key—1: Retractable entrance gangway, 2: Foyer, 3: Purser's Office, 4: Baggage Rooms, 5: Main Lounge, 6: Grill, 7: Galley, 8: Bar, 9: Men's Room, 10: Men's Smoking and Card Room, 11: Private Staterooms, 12: Powder Room, 13: Ladies' Room, 14: Rear Transverse Corridor, 15: Front Transverse Corridor, 16: Observation Deck, 17: Pilots, 18: Navigator, 19: Chief Engineer, 20: Captain, 21: Bunks for relief crew, 22: Landing-gear (retracted), 23: Six jet engines in each wing, 24: Engine air intake scoops beneath wing, 25: Air Separator Fins, 26: Elevons, 27: Trim and Rudder Flaps, 28: Wing Flap, 29: Wing slots, 30: Boundary-layer control slots, 31: Multiple fuel tanks.

TELEVISION SETS COST MONEY

BECAUSE television receivers use lots of tubes in very complicated circuits, they are much more expensive than ordinary radio sets. Table models with 7-inch image tubes range upward from \$180. The most popular home sets have 10-inch tubes and begin at about \$300. There is practically no upper limit on this price for a television set.

To give you an idea as to what the market offers, MI has selected some representative receivers and presents pictures and descriptions of them on these pages. The prices indicated do not include cost of installation, which runs from about \$50 to \$100 and includes service, free of charge, for the first year. *

Motorola's table model receiver with 7-inch tube is simple but neat at \$179.50. Loud speaker is behind the grille on the left.



At \$269.50, this Emerson, 16 inches square by 20 deep, is probably the cheapest 10-inch set. Speaker opens on cabinet's right side.



Modern design, with the loud speaker mounted in the top of the curved cabinet, feature this Farnsworth receiver. It has a 10-inch tube. List price is \$375.



This RCA-Victor table model with 10-inch tube has been a popular seller at \$325. Sets with fancier cabinets cost much more.



A complete 10-inch television receiver and a regular FM-AM sound receiver are combined in this striking General Electric set. That's a lot of radio. Cost, \$450.



Typical of the more elaborate pieces of television furniture is RCA-Victor's Model 630TCS. The 10-inch tube is set in a cabinet styled to stop your eye. Price, \$450.



A 20-inch image tube, largest in general use today, makes this Dumont television-radio-phonograph set good for clubs. \$2495.



Dumont, a pioneer in the television field, uses a 12-inch image tube for this slant-edged table set. The viewing screen is 7½ by 10 inches. The price is \$445.



A small television tube in this \$1195 RCA-Victor model throws the picture onto the back of a 15-by-20-inch translucent screen.



Besides a line of 10-inch sets, Philco makes this big projection receiver. The screen, 15 by 20 inches, folds down and forms part of the cabinet's top when not in use. Price, \$800.



You'll never lack entertainment in your home with this swank Dumont set. It has an automatic phonograph, FM-AM-short-wave radio, 15-inch tube but \$1795 price!

Truck Walks on Wheels

ROCKER ARM CUT AWAY TO SHOW
SEALED-IN CHAIN-WHEEL DRIVE

STANDARD TRUCK
POWERPLANT

REAR WHEEL IN
TRACTION POSITION

FRONT WHEEL IN
BEARING POSITION

Inventor Kopczynski, at right, checks the electric
motor on his walk wheels after test run in mud.



ADMIRAL Richard E. Byrd's transport troubles in the Antarctic ten years ago started John F. Kopczynski, a student engineer, thinking:

"Why can't wheels walk?"

Conventional wheels merely spun and bogged down helplessly in the deep snow. Walking wheels could pull like the tracks on a tractor without the great weight, awkwardness or slowness of such gear. The fact that nobody had ever come up with a basic improvement on the wheel since the invention first rolled out of the Stone Age, did not keep young Kopczynski from plugging away at his idea for a walking wheel.

After ten years of experiments, Kopczynski, now head of the Pivot Punch and Die Corporation at North Tonawanda, N. Y., this spring rigged up a working model and finally showed that wheels can walk. MI's artist Frank Tinsley has carried Kopczynski's walking [Continued on page 143]

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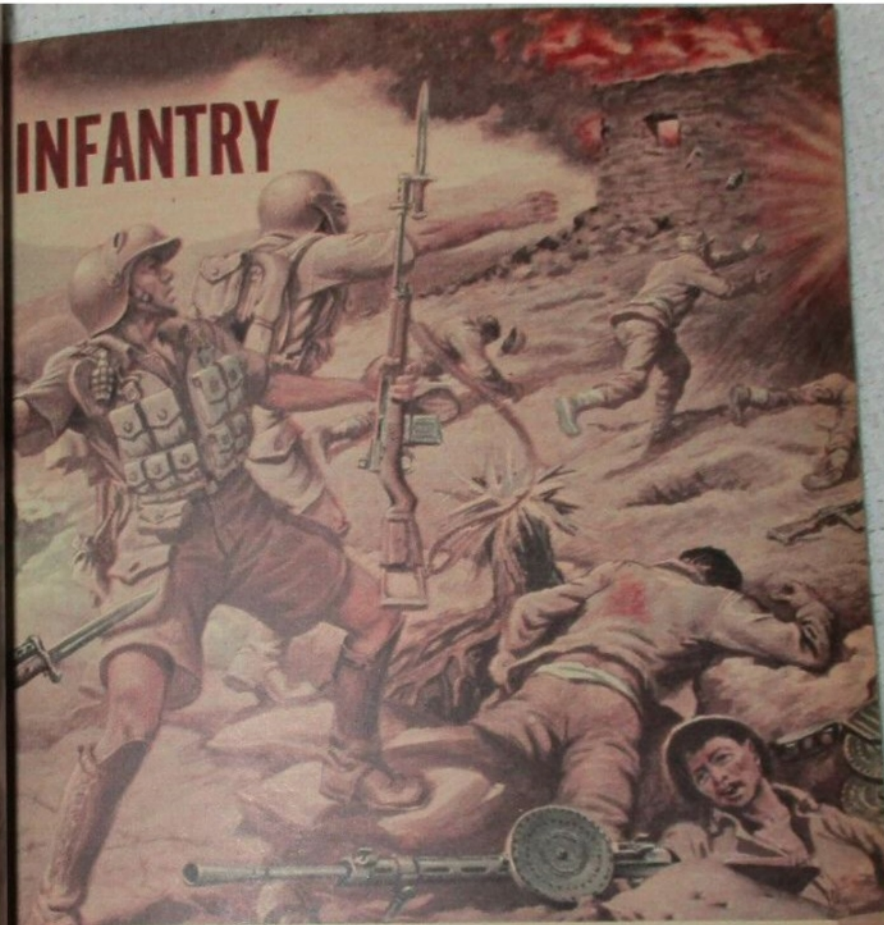
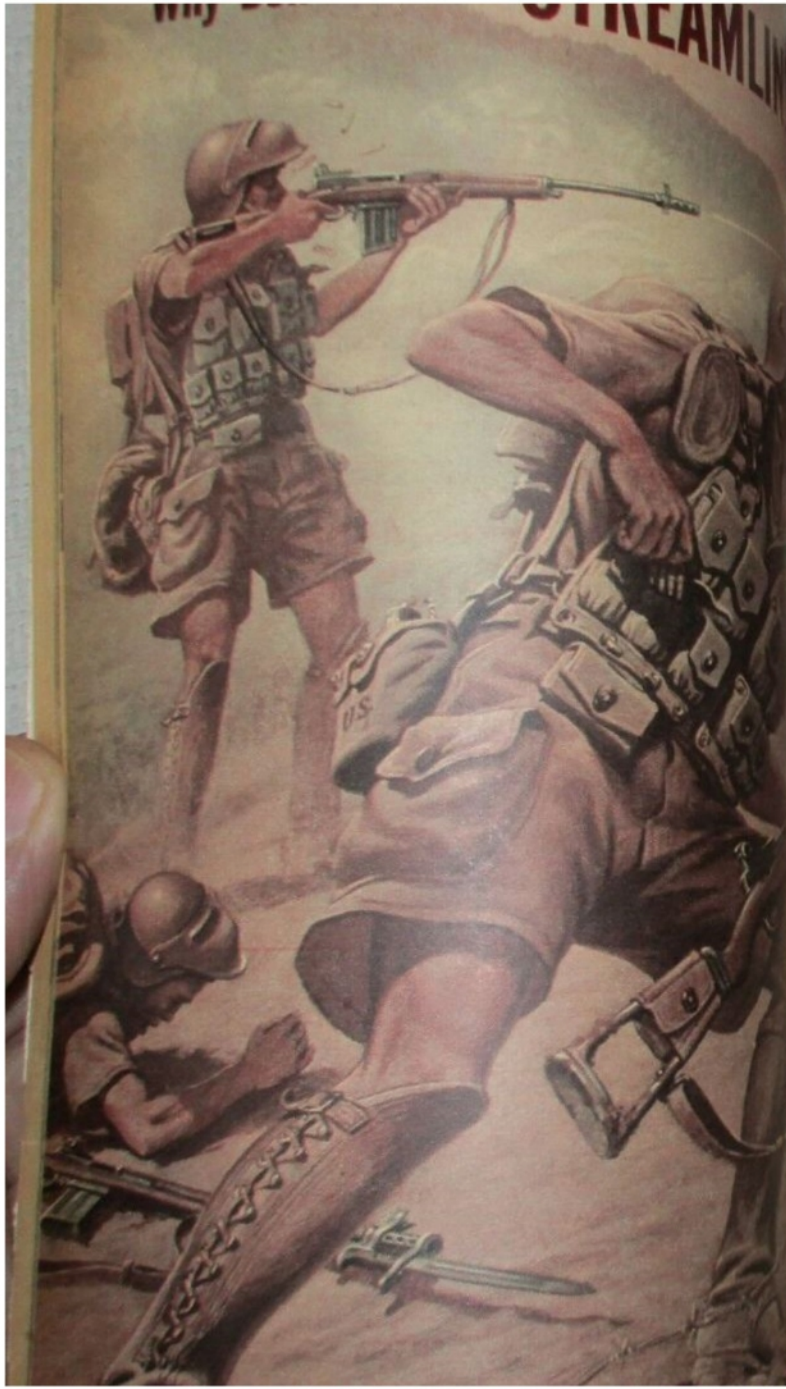


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We owe our fighting GI's the lightest, most efficient, safest equipment modern science can devise.

By Frank Tinsley

WHY don't we streamline the infantry?

Why don't we cut down drastically on the weight of ammunition, weapons, equipment and other paraphernalia the doughfoot has to lug around—and at the same time give him lightweight head and body armor that will protect him from enemy gunfire without interfering with his speed of movement?

Actually there are many things that are being done—and many more that can be done—to make G.I. Joe a faster moving,

a mere sliver of the industrial revolution between the growth of Polar air well aware even hemisphere. Russia has established a system of flying fields in eastern Siberia and we have countered with a tri-angled defense of these vital outposts. The ground defense of these vital outposts has become a pressing problem for us. It has been reported that at least eight Russian paratroop divisions are stationed at jumping-off points. To combat such possible attacks we need a comparatively small, highly mobile striking force, capable of destroying enemy airheads before they can be consolidated. This means a force built around fast, light tanks with heavy firepower.

Unfortunately, at present we have no small, speedy, paratroop destroyer to carry out this strategy. Our standard tanks were designed mainly for operations in North African and European terrain. They're too heavy and slow for agile Arctic warfare. Last year's maneuvers even our "light" tanks bogged down completely in the marshes.

We need an entirely new type of vehicle designed to operate under Arctic conditions. We have a successful cargo carrier that may serve as a springboard—the Weasel. It was produced during the last war to meet similar operating conditions. With its wide, caterpillar tracks and hull, it could snowshoe across the surface of quaking mud through muddy swamps that any other vehicle.

Weasel as a model, let's see produce in the way of an Arctic tank to run down enemy paratroopers in Alaskan wilderness.

It must be small and light, wide as possible to give it a large surface. Its armor need not be tough to turn small-arms fire—it will have to depend on speed to evade bazooka and armor-piercing, on the other hand, it must have a high rate of fire power.

It must be simple and drafty, easily presentable on the drawing board. As for crew, armament and weight, let's limit it to a six-foot high to a six-foot helmet by a scant

As wide as it is long with an exceptionally stable, almost Weasel-type tracks are each three feet wide, giving the machine a traction surface of 45 square feet—two-thirds of its overall size. The Pigmy's tucked-up belly permits it to negotiate all sorts of rugged terrain, deep water crossings, rubber pontons, peller, taking off from the rear of the box and a small rudder provide the propulsion and control. Both are protected above the belly line and are immune from ground damage by a heavy protected plate.

The power plant consists of a six-cylinder version of the new aircraft engine recently developed for the Ordnance Department. It's equipped with an automatic transmission and the usual tank engine and brakes. The engine and transmission are mounted amidships in a fireproof compartment with cooling louvers opening on the rear deck. An airplane-type fan occupies the space forward of the cell wall. The transmission and rear end take up the after section of the first.

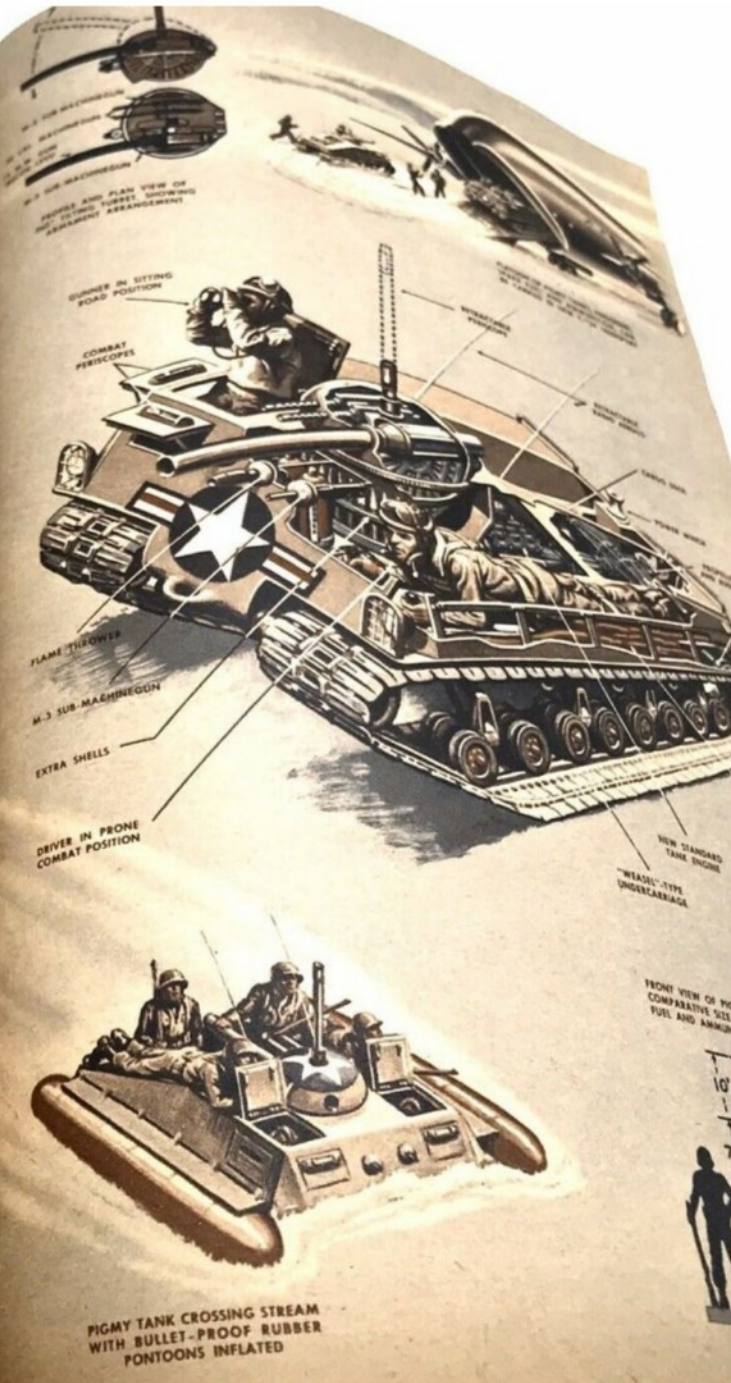
The regular crew of this Arctic Pigmy consists of two highly trained non-coms. A sergeant-gunner commands the combat team and a corporal driver-mechanic operates the tank. Each is trained to replace the other. In an emergency, the tank can be operated single-handed.

For this purpose, all driving and fire controls are duplicated. And to minimize the effect of an enemy hit, the men are widely separated, each occupying individual armored compartments atop the tracks. During action, they ride in "prone pilot beds" similar to those recently adopted by the Air Force. Combat periscopes, built into the forward and side hatches, provide good visibility ahead and to the flanks. In addition, a submarine-type periscope permits a telescopic, 360 degree field of vision.

The Pigmy's armament is varied. A 75mm recoil-less gun takes care of long range bombardment. The gun's light weight and compactness—105 pounds, 80x12 inches—make it a natural for light tank use. It's fitted with a gas-operated, semi-automatic loading mechanism and a drum-type magazine. Sighting is through the telescopic periscope.

[Continued on page 148]

Mechanix Illustrated



PIGMY TANK CROSSING STREAM WITH BULLET-PROOF RUBBER PONTOONS INFLATED

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Can Science Solve **SECRETS of VANISHING SHIPS?**

By Lester David

"CAN you get through to New York?" The skipper spoke urgently into his radio man's ear as the ship creaked ominously in agony.

"I can hear 'em, but faintly," Sparks yelled back from the rattling wireless key.

Two living walls of speckled green rose on both sides of the Hopestar, 5260-ton British freighter 600 miles out of New York. The great foam-topped waves teetered mockingly to port and starboard, then smashed onto the deck. The ship quivered in every beam.

"Send the SOS—keep sending it as long as you can!" the skipper shouted.

New York heard the distress signal several times before it faded. The U. S. Coast Guard and the Royal Canadian Air Force scoured the sea relentlessly for months

after this desperate radio call for help last Nov. 21. But the hunt has been fruitless. And that SOS was the last the world has ever heard from the Hopestar and its 37 officers and men.

This spring the Coast Guard was searching for the answer to an even more sensational mystery of the sea—a strange new "Flying Dutchman" sighted some 70 miles east of Charleston, S.C. The tanker Richard J. Cleveland, ploughing through heavy seas at noon, spotted a two-masted schooner yawing back and forth before the wind and rolled off course to investigate.

As the tanker drew alongside, she blasted her whistle but found no sign of life aboard the schooner. The sails were torn and two of the jibs were trailing through the waves. The crew could not have left by lifeboat, since the vessel's sole dinghy was still

Flaming meteors may rain sudden disaster on a ship, as above—creating a new mystery of the sea.

Is the hulk-strwn Sargasso Sea, pictured below, a myth or actually a real Port of Missing Ships?





FRANK TINSLEY '50

This is how a helicopter might be used to drop shaped-charge bombs on enemy sub.

Bazooka Bomb: Newest Sub-Killer

IN World War II the German commanders of the Panzer divisions were mystified by a new American weapon which effectively was knocking out their tanks. At first they thought it might be a new kind of mortar. Actually they were being introduced to our bazooka and its shaped-charge shell. In the Korean war this same weapon proved to be a potent threat to the Communists' heavy armor.

The shaped charge was designed in 1887 by Charles Monroe, an American explosives expert, but its military research did not begin until early in the last war.

Its principle—and formerly its secret—is simply its shape. A very powerful explosive, TNT or Pentolite, is placed in a container with a conical, steel liner indenting its forward end. The charge is not allowed to touch its target, but is held at a definite "stand-off" distance. When it explodes, the force is funneled forward, compressing the sides of the conical liner into a solid slug and driving it out with tremendous impact. The result is that a hole is punched in the target. As a bazooka bomb it blasts holes in a similar manner through a tank's steel sides.

MI artist Frank Tinsley has designed a new use for our shaped charge, and that is as an anti-sub weapon. Small projectiles can be dropped in a pattern from hovering helicopters. Upon striking the skin of the sub, they would punch a number of holes through it causing the commander to surface his ship where it could be attacked easily by naval planes and guns.

The larger bazooka above is the 3.5 rocket launcher. Its shaped-charge projectile can penetrate 11 inches of armor plate. It knocked out eight enemy tanks in its first day of action in the Korean war.



Closeup view of the super-bazooka and its rocket-propelled charge. Note its pistol grip, shoulder support and eye-piece sight with elevation scale.

poof

gold. The Tibet have a variety of scientific facts, as an explorer of Tibet.

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Why Don't We Build ...

FLYING AIRCRAFT CARRIERS



By Frank Tinsley

A jet-propelled super-dirigible carrying a fleet of atom bombers would be the deadliest weapon of aerial warfare.

A giant rigid-type dirigible is the only kind of aircraft capable of carrying a flight of atom bombers into the heart of enemy territory. And it is possible to build this equivalent of the modern sea-going aircraft carrier. How? The answer is concealed in files of the U. S. Navy forgotten since the loss of the giant dirigible Macon in 1935.

Let's see how such a ship might be constructed using the know-how we already possess.

It would be huge, much larger than the Macon and Akron. It would be about 1,350 feet long and 150 feet in diameter with a displacement of nearly 12,000,000 cubic feet. With eight jets developing 80,000 pounds of thrust, its top speed would exceed 300 mph.

Rather than a construction of wire-braced circular frames connected by long-erons and covered with fabric as had its predecessors, it would have a fish-like skeleton. From a central spine would radiate spoke girders forming structural wheels the rims of which would be connected by longitudinal girders. A metal skin such as that used on the ZMC-2 in 1930 would furnish additional strength.

In this ship such a metal skin would be a necessity because of the stresses involved in high-speed flight. Its gas-tight character would eliminate the internal balloons previously necessary for holding helium. Gas-tight main frames would divide the ship into separate compartments, making it practically unsinkable.

Amazing Marvels of

TOMORROW

Here is an on-the-spot report
of what the future holds for you—by
MI's editor in the year 2055!

Recorded by O. O. Binder

GREETINGS, people of 1955, from the 21st
Century!

This is Jon Graw, editor of *MECHANIX ILLUSTRATED* in 2055 A.D., speaking to you over the new Future Phone recently invented. Merely by dialing MI-1955, my call hooked into a time-trunk-line that connected with your phone circuits. Thus, we of a century ahead can speak directly to you and give you a peek into your future.

Perhaps many of the things of which I shall speak will seem amazing wonders to you, too fanciful to be true. But don't underestimate your scientists and technicians of 1955, for they will produce inventions and make discoveries of which you know nothing as yet, or hardly dream of. If not you, then your children or grandchildren will see them come to pass, one by one.

Suppose we take you on a tour of our world of 2055, as if you had been bodily transported here and saw it all with your own eyes. Suppose, too, that you are a typical citizen of our time, living in a suburban community.

A typical community of the future—covered with a giant Glassteel shell and weather-controlled.

Art by Gurney Miller

Gurney Miller

COVER STORY





IBM MEANS "I BRING MASSACRE"

Roaring at 10,000 mph,
this Intercontinental
Ballistics Missile can
destroy a city half a
world away in less
than one hour's time.

By Martin Caidin

C-1.

Remember that designation. It's the code name of the world's most fantastic rocket weapon—a hypersonic glider capable of crossing an ocean at speeds up to 10,000 miles per hour!

More than ten years ago the Ordnance Department of the U. S. Army launched with the General Electric Company a new rocket research program dubbed Project Hermes, which has expanded into what is probably the world's



TOM McCaHILL REVIEWS HIS TEN YEARS OF CAR-TESTING

MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

International Edition

Vol. 5 No. 67

2'6 in New Zealand

and 3'3 in Australia

2s.



U.S. AIR FORCE REVEALS ITS FLYING SAUCER
BUILD YOURSELF A TILED TABLE-STUDIO COUCH



COVER STORY

How The Flying Saucer Works

If you haven't seen saucers yet, you will—and they'll be built to Air Force specifications.

By Willy Ley

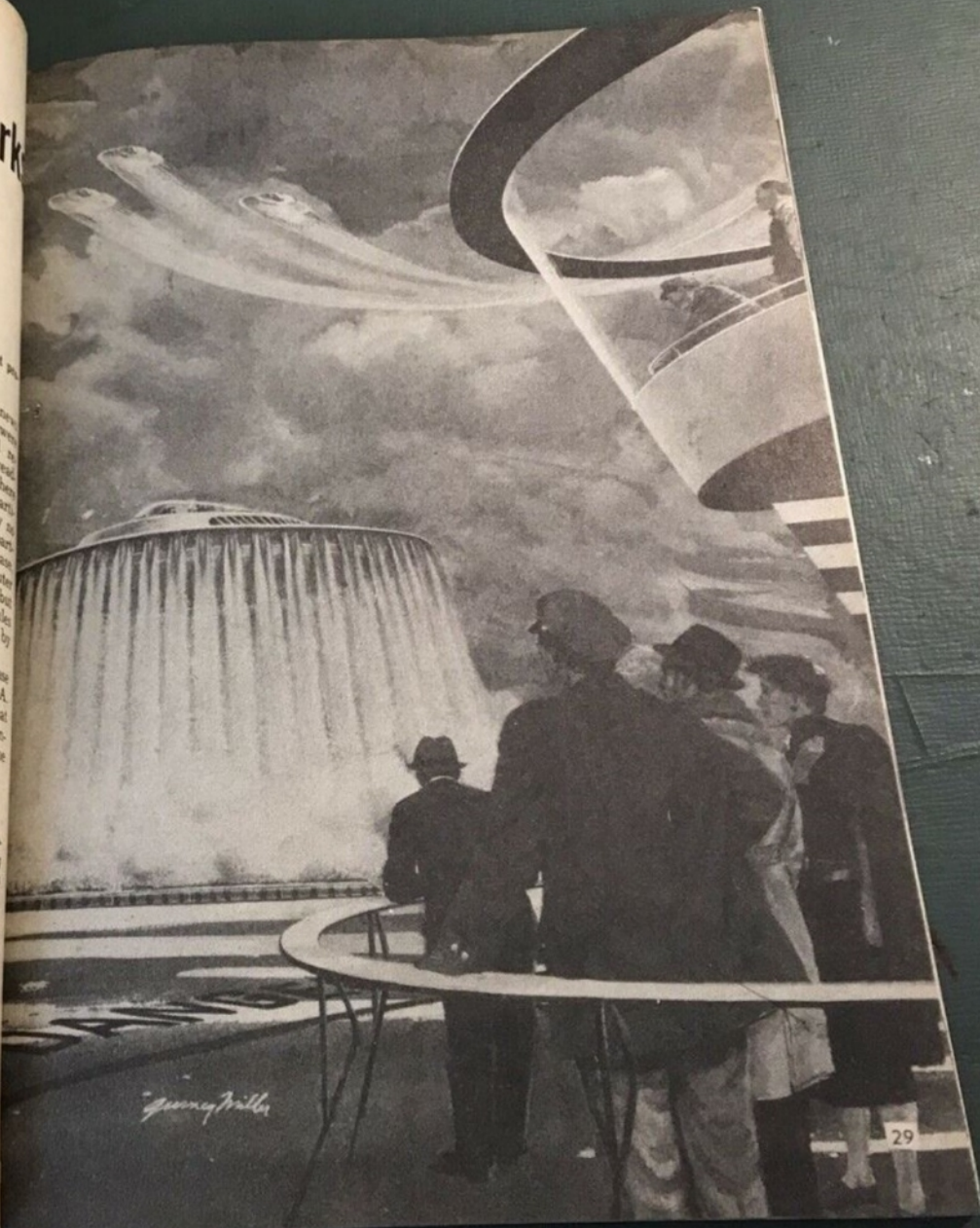
Editor's Note: Ever since 1950 when TRUE The Man's Magazine discussed existence of flying saucers, the world press has been continuously interested in the flight possibilities of disc-shaped aircraft. The most bilities of disc-shaped aircraft. The most recent Air Force report on flying saucers, issued in November 1955, states that there are rational explanations for practically all the so-called flying saucer "spotting." Most interesting portion of the Air Force report to many readers, however, was the section dealing with America's plans for building a disc-shaped aircraft capable of vertical flight and easy maneuverability. To bring you more details on exactly how such a craft would operate, we have asked the world-famed authority on rockets and guided missiles, Willy Ley, to visualize for us how the craft now under development for the U.S. Air Force might be constructed in the light of what is now known about jet propulsion and vertical flight. Mr. Ley's observations are based on conversations with VTO authorities in the U.S.

Artist Gurney Miller's concept of a typical airport scene in the not-too-distant future: spectators at an Air Force saucer base are watching the takeoff of a disc-shaped, two-man interceptor. The aircraft in its vertical flight phase employs jet nozzles and Coanda flaps located all around its rim. With jet exhausts directed downward in this manner the flying saucer will be able to rise, descend and hover—giving it the safety and comfort factors of the modern helicopter. As soon as the saucer has reached a suitable altitude the pilot will shut off all but a certain number of the after jet nozzles, thus converting the aircraft to forward flight. In that phase the saucer will operate like any jet plane. Its stability will be achieved through the use of jet air intakes, visible above the rim of the saucer, as wing slots or internal vertical surfaces. Forward speed of the saucer in flight should be near the sonic. Landing pads for the saucers need be only slightly larger than the saucers themselves, but must be of material resistant to high temperatures.

and on a lifetime of research in jet propulsion and rocket-powered flight.

EVEN the most devoted science fiction and science fiction readers were surprised by a series of official releases that enlivened newspaper reading last summer and fall. First was the White House release about artificial satellites, to become a reality later than 1957. Then came the reality statement of Defense "flying saucer" release dealing not with machines from outer space manned by small green men, but with a product of terrestrial slide rules and American factories, to be flown by American pilots.

In the Defense Department release Secretary of the Air Force Donald A. Quarles was quoted as saying that AVRO Ltd. of Canada had a USAF contract to build an aircraft similar to the



A SHORT COURSE IN BRICKLAYING

MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

International Edition

Vol 6, No 83

3/2 in Australia

2/6



Coast-To-Coast Nonstop In
MI'S FABULOUS FAMILY CRUISER
See Page 70



David Lockhart

BUILD YOURSELF A TOOL HOUSE
McCAHILL TESTS THE IMPERIAL
MAKE YOURSELF A PIPE

Radome Plane Warns
Of Sneak Atom Attacks





distances. While its top speed is considered exceptional by the plush buggy still might be speed because of its ability to go hours with not a single stop. is put in the 70-75 mph range. be nothing to brag about but expressway it's also nothing to. Although the Highway Cruiser has been built and must be regarded for the future, there is nothing that is not currently available nical developments are necessary idea a reality.

Power plant requirements of a diesel engine because of its high rpm pace for long periods work up a head of steam. A piston or free-piston mill might be used Cruiser when these engines finally in production stage.

Sleeping and eating accommodations possible a Massachusetts-to-Oregon stop for refueling!

Both full meals and snacks can be aboard the Cruiser. Its bunks provide ing space for six persons and in a seventh bunk can be added. With the filled the car actually could hold 13 although this would be considered a comfortable capacity. Maximum bunks and seats occupied is 13.

Let's take a closer look at the Cruiser yacht. Its size strikes your eye first. of today's 18-ft. lengths, the Cruiser is 30 feet long and up to eight feet wide. **Driver's Bridge:** The bridge sits on engine and is covered with steel-lam to give the operator full visibility in high position in the snub nose. Lamin prevents glare and over-heating from the A remarkable feature of the bridge is its controls—a full set on each side. No loss ing of speed, let alone a stop, is required

EFFICIENT LAYOUT of Cruiser



OBSERVATION COCKPIT, an open-air sitting room, can be protected with a canvas top in the summer and is closed in with a plastic bubble in winter. Lounge is in foreground.

a relief driver takes over. The new operator merely slides into the unoccupied front seat, control is transferred to him and he starts driving. Control can be switched to either side by flipping two selector levers located on the dash near the left and right steering columns. For the sake of safety, each driver must throw the lever on his side before the change is complete. The steering wheel and pedals not in use do not monitor the other set, as in dual-rigged airplanes, because of the danger that someone might accidentally grab the unused wheel and cause the driver to lose control.

The driver seats are basically the airplane type with armrests added.

They pivot both ways to aid a person getting into one of them from the aisle or through either front door.

Intercom microphone-speakers are mounted in the center of the steering wheels, connecting the bridge with stations in the lounge, galley and cockpit. The circuit also is hooked to the radio and record-player.

Rear-View TV: A small television screen on the dash directly between the driver positions probably has caught your eye by now. This is a closed-circuit receiver showing images from a camera mounted on the rear of the Cruiser and trained on the lane directly behind, giving either driver perfect rear vision. Large exterior rear-view mirror

maximum use of inside space. Four bunks are provided by lounge, two by dinette.



Spaceship



Conquers Gravity

By Michael Gladych

*It will fly at the speed of light—making
a round-trip to Venus in about 30 minutes!*

THE spherical craft squatting on a concrete strip emitted a faint hum. A ghostly glow surrounded its shell. The strange craft rose and hovered momentarily while its landing gear retracted. Then the hum increased and the craft shot eastward and vanished beyond the horizon before the witnessing scientists could click their stop watches.

Jet-powered missile? No. Made weightless and propelled by its anti-gravity engine the round ship was a research vehicle able to travel at almost the speed of light—600,000,000 mph.

How soon will such a revolutionary craft take to the skies? Since 1953 the Canadian government's Project Magnet has been working on a gravity-defying vehicle powered by electromagnetic forces. At least 14 United States universities and other research centers are hard at work cracking the gravity barrier. And backing the basic research with multi-million dollar secret projects is our aircraft industry. Convair on the west coast, Glenn L. Martin Aircraft Co. of Baltimore, Md., Bell Aircraft Co. of Buffalo, N. Y. and Sperry Gyroscope Co. of Great Neck, L. I. maintain teams of researchers and engineers prying into Nature's most jealously guarded secret—gravity. "Aviation is on the threshold of amazing new concepts," said the late Lawrence D. Bell, level-headed builder of the Bell rocket research planes. "We are already working with nuclear fuels and equipment to cancel out gravity instead of fighting it."

Even before the famous apple fell on Isaac Newton's head, men were trying to solve the gravity problem. But from the simple pre-historic lever to the most intricate modern machinery, the best we could do was to achieve a temporary victory.

"What goes up must come down," said the biggest scientific brains, helpless before the mysterious gravity pull. Newton and other great physicists formulated the gravity laws, measured gravity pull and passed their findings to posterity.

But their gravity "laws" had several exceptions that bothered inquiring minds. Take the strange behavior of liquids, for example. Move your fingertip slowly toward the surface of water and watch the water jump up to hug your finger. Or put a soda straw into the water and see the water level inside creep above the outside level in defiance of the earth's gravity pull. To get an even more striking contradiction of the gravity laws, drape a towel over the edge of a basin half-filled with water. After a time the water will climb up the towel and over the side. These and other strange anti-gravity tricks were considered freaks of molecular attraction—phenomena quite apart from gravity—until Albert Einstein came up with his Theory of Relativity.

Einstein said that molecular attraction is really no different from the gravity pull of the planets and stars. He theorized that this attraction works on the same principle as electromagnetism. A molecule, a planet or a star all have gravitational fields just as magnets or electromagnets have their magnetic fields. To illustrate the similarity, Einstein said that a gravitational field would attract and bend light rays just as a magnetic field bends cathode rays in your TV picture tube.

Dr. Stanley Deser and Dr. Richard Arnowitt of the Princeton Institute for Advanced Study have recently discovered new sub-nuclear particles of the atom. Bombarded by powerful electro-

...the stars using ion rocket to control direction. The outer ... to reveal the inner artificial gravity wheel for crew

Shuttling into Space

national-defense advantages of mounting a space-based anti-aircraft defense system.

But now NASA figures out how to stick the shuttle up in the sky, it will have all sorts of problems. Getting people and supplies back and forth from orbit will only prove practical if we have a way to get them down. It will require an enormous effort to recover the shuttle and its cargo from ground-to-orbit and back to earth.

Right now space travel for our astronauts is a one-way proposition. Total investment for a lunar mission is \$10 billion and more of the hardware is one-way. Shuttle command modules come back to earth, but the external tank and solid rocket boosters are discarded. NASA officials figure that the first shuttle will cost \$1 billion to build and \$100 million to fly.

The answer lies in reusability. The shuttle program is a one-way proposition, the same vehicle is used over and over, perhaps 100 times or more. It's a one-way proposition, repair and turn-around is the key. "You can't go up, back the time and go," says James Hansen, President Nixon's special adviser on behavior. He gave up priority in a program that would be a routine, aircraft-like use.

SHUTTLE is also a one-way proposition, with the external tank and solid rocket boosters discarded after each mission.

The shuttle is a one-way proposition, in addition to being expensive, it's operationally limited. They must be launched over water to avoid the danger of spent casings falling on populated areas. They are frustratingly inflexible when compared to airplanes and the services of hundreds of men and machines are required for launching and recovering the crews of astronauts.

A reusable system will mean a whole new concept for a hybrid vehicle that will be part rocket, part spacecraft and part airplane. Officially named the Integral Launch and Recovery Vehicle (ILRV), or space shuttle, the hybrid must be designed to carry up to 12 people—two pilots and ten scientist-passengers—and up to 10,000 lbs. of cargo.

It will have two stages. A piloted booster, launched from present-day facilities at Cape Kennedy, will carry a spacecraft payload part way to orbit. The booster, about the size of a Boeing 747 jumbojet, then will fall off and be flown back to a landing site and readied for its next mission, possibly within two weeks.

The reusable spacecraft, under its own power, will rendezvous and dock with a space station, complete its mission, spending only 10 days in orbit, and then head home. Pilots will steer the shuttle into the atmosphere for a controlled glide and landing in a conventional 10,000-ft. long runway.

"We're having to learn to be airplanes again," says Martin S. Fugitt, director of engineering. [Continued on page 134]



SECRETS OF SUCCESS IN DOOR-TO-DOOR SELLING

MECHANIX ILLUSTRATED

THE HOW-TO-DO M

STILL
25^c
MARCH

Here is the Suit
Our Astronauts Will Wear
to Explore the Moon

Tom McCahill Tests
CHEVY'S FAMILY VAN



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MRS C J ROSSMITH
8955 HOLMAN AVE
DELAIR N J

COVER STORY

HERE'S WHAT THEY'LL WEAR ON THE MOON

SPACE SUIT encases this lunar explorer setting out with radiation counter and antimagnetic hammer across moon's surface.

A TWO-PIECE aluminum suit for moon wear has been designed by Republic Aviation. The apparatus maintains proper pressure, temperature, humidity. An oxygen supply and carbon dioxide absorbers keep the man inside breathing easily. The wearer has controls for these functions as well as a radio communication unit, food and waste storage bins, searchlight control, an electric power supply, rest tripod and a built-in seat. The moon's weak gravity will allow wearer to toddle about easily. •



SHOULDER HARNESS holds up the bottom half of the space suit.



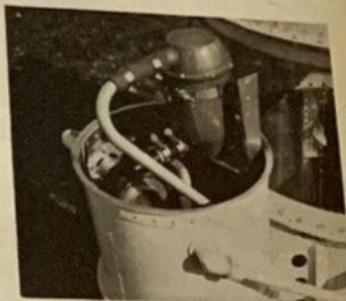
DOUBLE-SOLED safety shoes will make it easier for astronaut to walk on the moon.



RETRACTABLE stanchions can be extended to allow wearer to sit down in the suit.



INTERIOR of top half of space suit shows spotlight control and full viewing window.



TANK attached to rear of suit encloses mechanism to purify and recirculate air.



TRANSISTORIZED transceiver in suit permits communication with mother vehicle.



OXYGEN TANK installed in bottom half of suit supplies oxygen to air for four hours.